

IMPLEMENTATION OF A QUALITY PHYSICAL EDUCATION PROGRAM AS DEFINED
BY THE NATIONAL ASSOCIATION FOR SPORT AND PHYSICAL EDUCATION OF
PUBLIC HIGH SCHOOLS IN SOUTHWESTERN PENNSYLVANIA.

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Keri S. Kulik, PhD

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Improving the quality of physical education is necessary to achieve potential health-benefits in the child and adolescent populations. **PURPOSE:** This study described instruction time, teacher qualifications and facilities available to support physical education in high schools (10th, 11th, 12th grades) located in Southwestern Pennsylvania, and examined whether there are demographic characteristics of the school (locale, size, socio-economic status) that affect these components. **METHODS:** 39 of the 91 public high schools in Allegheny, Beaver, Indiana and Westmoreland counties were recruited to participate in this cross-sectional quantitative study. The physical education department chairperson or physical education teacher designated by the school district was invited to complete an electronic self-administered survey. The online survey assessed time requirements for physical education, teacher qualifications, and instructional facilities that the National Association for Sport and Physical Education (NASPE) has identified to be important for offering quality physical education programs. **RESULTS:** The number of days that physical education was offered per week was 2.8 ± 1.4 , 2.7 ± 1.4 , and 2.5 ± 1.4 in 10th, 11th, and 12th grades, respectively. Physical education was offered for 104.9 ± 54.3 , 100.1 ± 55.1 , and 92.3 ± 53.4 min/wk in 10th, 11th, and 12th grades, respectively.

Further analysis showed that the allocated physical education instruction time was not influenced by physical education teacher qualifications or facilities available to support physical education instruction. Moreover, the pattern of results was not affected by school size, school locale, or socio-economic status of the school. **CONCLUSIONS:** The results of this study suggest that high schools in Southwestern Pennsylvania do not offer physical education daily and do not offer the recommended 225 minutes of physical education per week. It does not appear that the factors recommended by NASPE influence the amount of time that is allocated for physical education instruction. However, this does not suggest that these factors do not influence physical activity time within physical education. Thus, it may be necessary to revise the NASPE guidelines for quality physical education to include participation in physical activity rather than duration of instruction time.

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1.0 INTRODUCTION AND RATIONALE

For over a century, schools have played a central role in providing opportunities for children and adolescents to participate in physical activity (58). Traditionally, students have engaged in physical activity during physical education, recess breaks, walking or biking to and from school, and participation in school sports. Physical education has been a part of the school curriculum since the late 1800's and school sports has been a component of educational institutions since the early 1900's (72). However, alarming health trends are emerging suggesting that schools may need to reevaluate and expand their role in providing physical activity to children and adolescents (72).

The current public health recommendation is for children and adolescents to participate in 60 minutes of daily physical activity (9). Participation in regular physical activity has been shown to help control body weight, maintain healthy bones, and decrease the risk for developing chronic diseases such as cardiovascular disease, hypertension, and diabetes mellitus in children and adolescents (5, 63). Although the benefits of physical activity are clear (26), many children and adolescents do not participate in regular physical activity. Based on the results from the 2007 National Youth Risk Behavior Survey, only 35% of high school students meet the recommended level of physical activity (40). Moreover, the percentage of students participating in 60 minutes of daily physical activity decreases as one progresses across the 9th (38.1%), 10th (34.8%), 11th (34.8%) and 12th grades (29.5%).

Schools have an opportunity to influence and encourage participation in physical activity, (39), and physical education has been targeted as the most effective way to increase physical activity among students (25, 39). The National Association for Sport and Physical Education (NASPE) has developed specific guidelines for the amount of instruction time, teacher qualifications and instructional facilities, which have been identified as factors that may be important for increasing physical activity in children and adolescents (23, 51). These guidelines provide schools with specific criteria that are designed to provide increased opportunities for students to engage in physical activity, ensure that the individuals delivering physical education are certified and/or licensed, and to make certain that there is appropriate safe space for physical education to be administered (51). It has been suggested that physical education programs that meet these specific criteria will provide increased opportunities for children and adolescents to participate in physical activity. However, it is unclear if schools are able to meet the NASPE guidelines for instructional time, teacher qualifications and instruction facilities or whether this indeed impacts the quality of physical education in these schools. Moreover, it is unclear whether other factors, such as demographic factors, are associated with a schools ability to achieve these specific NASPE guidelines for a quality physical education program.

1.1 SPECIFIC AIMS AND HYPOTHESES

The specific aims of this study were:

1. To examine the relationship of the physical education student-to-teacher ratio and the number of minutes physical education is offered per year in selected public high schools in Southwestern Pennsylvania.

Hypothesis: It is hypothesized that as the student-to-teacher ratio decreases, the number of minutes physical education is offered per year to students increases.

2. To examine the relationship of number of teachers with an undergraduate or graduate degree in Physical Education and the number of minutes of physical education offered in selected public high schools in Southwestern Pennsylvania.

Hypothesis: It is hypothesized that high schools with more teachers who have an undergraduate or graduate degree in Physical Education will offer more minutes of physical education to high school students.

3. To examine the relationship of facilities available to support physical education and the number of minutes of physical education offered in selected public high schools in Southwestern Pennsylvania.

Hypothesis: It is hypothesized that high schools with more physical education facilities will offer more minutes of physical education to high school students.

4. To examine if school size (A, AA, AAA, AAAA), locale (large city, mid-size city, urban fringe of a large city, urban fringe of a mid-size city, large town, small town, rural outside a Metropolitan Core Based Statistical Area, and rural inside a Metropolitan Core Based Statistical Area), or SES status (defined by free/reduced school lunch) influences the association between the physical education student-to-teacher ratio and the number of minutes of physical education is offered to students per year in selected public high schools in Southwestern Pennsylvania.

4a. Hypothesis: It is hypothesized that larger high schools, when compared to smaller high schools, will have a lower physical education student-to-teacher ratio and this will result in more minutes of physical education minutes being offered to students per year in these high schools.

4b. Hypothesis: It is hypothesized that high schools with a locale of “urban fringe of a large city” will have a lower physical education student-to-teacher ratio and this will result in more minutes of physical education being offered to students per year in these high schools compared to high schools in other locale classifications.

4c. Hypothesis: It is hypothesized that high schools with a lower percentage of students receiving free or reduced lunch will have a lower physical education student-to-teacher ratio and this will result in more minutes of physical education being offered to students per year in these high schools compared to high schools with a higher percentage of students receiving free or reduced lunch.

5. To examine if school size (A, AA, AAA, AAAA), locale (large city, mid-size city, urban fringe of a large city, urban fringe of a mid-size city, large town, small town, rural outside a Metropolitan Core Based Statistical Area, and rural inside a Metropolitan Core Based Statistical Area), or SES status (defined by free/reduced school lunch) influences the association between the number teachers with an undergraduate or graduate degree to teach physical education on the number of minutes of physical education offered in selected public high schools in Southwestern Pennsylvania.

5a. Hypothesis: It is hypothesized that larger high schools will have more teachers with an undergraduate or graduate degree to teach physical education and this will result in more minutes of physical education minutes being offered to students in these high schools compared to smaller high schools.

5b. Hypothesis: It is hypothesized that high schools with a locale of “urban fringe of a large city” will have more teachers with an undergraduate or graduate degree to teach physical education and this will result in more minutes of physical education minutes being offered to students in these high schools compared to high schools in other locale classifications.

5c. Hypothesis: It is hypothesized that high schools with a lower percentage of students receiving free or reduced lunch will have more teachers with an undergraduate or graduate degree to teach physical education and this will result in more minutes of

physical education being offered to students in these high schools compared to high schools with a higher percent of students receiving free or reduced lunch.

6. To examine if school size (A, AA, AAA, AAAA), locale (large city, mid-size city, urban fringe of a large city, urban fringe of a mid-size city, large town, small town, rural outside a Metropolitan Core Based Statistical Area, and rural inside a Metropolitan Core Based Statistical Area), or SES status (defined by free/reduced school lunch) influences the association between the facilities available to support physical education on the number of minutes of physical education offered in selected public high schools in Southwestern Pennsylvania.

6a. Hypothesis: It is hypothesized that larger high schools will have more facilities available to support physical education and this will result in more minutes of physical education minutes being offered to students in these high schools compared to smaller high schools.

6b. Hypothesis: It is hypothesized that high schools with a locale of “urban fringe of a large city” will have more facilities available to support physical education and this will result in more minutes of physical education minutes being offered to students in these high schools compared to high schools in other locale classifications.

6c. Hypothesis: It is hypothesized that high schools with a lower percentage of students receiving free or reduced lunch will have more facilities available to support physical education and this will result in more minutes of physical education minutes being

offered to students in these high schools compared to high schools with a higher percentage of students receiving free or reduced lunch.

1.2 SIGNIFICANCE

The importance of improving quality of physical education is justified by the potential health-benefits that can be realized in children and adolescents. For example, a recent study by Datar and Sturm (71) reported an inverse association between the number of minutes that physical education is offered and BMI. Sallis et al (69) reported that improved physical education resulted in significant improvements in fitness, and fitness has been shown to have a significant impact on health-related outcomes (69, 71, 83, 84). To help define this relationship between physical activity and health-related outcomes, a study by Carrel et al (83) reported that participation in a quality fitness based physical education program resulted in a significantly greater loss of body fat, a greater increase in cardiovascular fitness and greater improvements in fasting insulin levels. Singh et al (84) reported that an improved physical education program resulted in significant differences in hip circumference, sum of skin folds and waist circumference. The results of these studies demonstrate that a quality physical education program may be important for improving health-related outcomes such as body mass, cardiovascular fitness and insulin levels in children and adolescents.

To define and guide the development of quality physical education programs, NASPE has developed specific criteria including the following components: instruction time, teacher qualifications and professional development and adequate facilities. There is evidence to support

that each of these components can affect the quality of physical education delivered in school settings. For example, Datar and Sturm (71) found that increasing the amount of physical education time resulted in a decrease in BMI among female students who were overweight or at-risk for overweight. Similarly, the results from a study conducted by Veugelers and Fitzgerald (74) revealed that participation in physical education classes two or more times per week was associated with a decreased risk of overweight and obesity. In addition, enhanced training of physical education teachers has been shown to be effective for improving physical activity time within physical education class. Results from the Sports, Play, and Active Recreation for Kids (SPARK) study demonstrate that physical activity time was increased when certified physical education teachers received additional training when compared to physical education teachers who received no additional training and non-physical education classroom teachers assigned to teach physical education (69). There is also evidence of a positive relationship between physical activity levels in students and the number of facilities, such as gymnasiums and outdoor spaces, available within the school to support physical activity (76).

Thus, there is evidence to support sufficient instruction time, physical education teacher qualifications and professional development, and adequate physical education facilities improve the quality of physical education as recommended by NASPE. However, what is unclear is the prevalence of schools achieving these components of the NASPE physical education guidelines and whether there are any demographic characteristics of high schools that are associated with the implementation of these guidelines as recommended. This information may be valuable in understanding how to improve the quality of physical education across schools representing diverse communities with diverse characteristics, and may lead to the development of

interventions and policies to facilitate the implementation of these recommendations to improve the quality of physical education in high schools.

2.0 LITERATURE REVIEW

2.1 PHYSICAL ACTIVITY

Physical activity is defined as any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level (20). Using this definition, physical activity is a key component of the expenditure aspect of energy balance and provides an outlet for daily caloric usage. Regular physical activity has been shown to help maintain healthy bones and muscles, control weight and reduce fat, and decrease the incidence of chronic diseases such as cardiovascular disease, hypertension and diabetes mellitus in the child and adolescent populations (5, 63). When compared to physically inactive children, physically active children may be less likely to experience chronic disease risk factors, to become overweight and may be more likely to remain active throughout adulthood (9).

To further support and help define the relationship between physical activity and improved health in children and adolescents, Schmitz et al (86) conducted a study to examine the association of physical activity with insulin sensitivity in 357 non-diabetic children. The results of this study revealed that physical activity was significantly correlated with fasting insulin ($p = 0.03$), insulin sensitivity ($p=0.001$). This suggests that participation in physical activity may result in a lower fasting insulin level and greater insulin sensitivity in children (86). Gidding et al (87) found similar results when examining the relationship between physical activity and specific health outcomes including blood pressure and cholesterol levels in 663 children. The

results of this study suggested that children who participate in a physically activity lifestyle experience a decrease of 1.15mm Hg of systolic blood pressure and a 1.28mg/dL decline in low-density lipoprotein levels for every 100 estimated metabolic-equivalent hours of physical activity. The study also found that for every 10 hours of intense physical activity, children experience a 0.2kg/m^2 decrease in BMI (87). A similar study was conducted by Gutin et al (88) to determine the effects of exercise intensity on body composition, cardiovascular fitness, and visceral adipose tissue of 80 obese adolescents. The results of this study revealed that participation in regular intense physical activity was positively associated with improved cardiovascular fitness ($p<0.001$), body composition ($p=0.001$), and visceral adipose tissue ($p=0.029$). The results of these studies demonstrate that physical activity is important for improving health outcomes in children and adolescents.

In addition to the improved health outcomes, physical activity also creates many positive benefits for young children and provides an opportunity for play activity and environmental exploration. Physical activity also facilitates the development of motor skills and increases energy expenditure (10, 63). Research has also shown that regular physical activity among children and adolescents can increase self-esteem and may reduce anxiety and stress (60). Strauss et al (89) examined the relationship between physical activity and self-esteem in 92 children aged 10 to 16 years. The results of this study revealed that the amount of time spent engaged in high level physical activity was correlated to self-efficacy ($p<0.05$) and improved self-esteem ($p<0.05$). In addition to the health benefits of physical activity in children, it has also been shown that activity patterns of children carry over into adulthood (9). With this knowledge, recent studies and interventions have begun to focus on ways to engage children in physical

activity such that they will remain active into their adult years, thus reducing their chances for the negative health risks associated with physical inactivity and overweight (9, 11, 58).

2.2 RECOMMENDATIONS FOR PHYSICAL ACTIVITY IN CHILDREN AND ADOLESCENTS

Research shows that a relationship exists between participation in physical activity and a decrease in the risk for developing diseases such as heart disease and diabetes (58, 26, 5). What is not as well known, in the adolescent and child populations, is the amount of physical activity needed to elicit these health benefits (5). Several recommendations, represented in Table 1, have been published by organizations including the American Heart Association (63), the National Association for Sport and Physical Education (61), American College of Sports Medicine (64), and Centers for Disease Control (62). The general recommendation from these groups is that children and adolescents should be physically active every day or at least on most days of the week. The individual reports, however, varied in duration, intensity and type of activity (9).

Table 1: Physical Activity Guidelines for Children and Adolescents

Organization	Age Group	Recommendations
American College of Sports Medicine	Children and Adolescents	<ul style="list-style-type: none"> Children and adolescents engage in 60 minutes or more of daily physical activity, which should be enjoyable, developmentally appropriate, and of various types.
American Heart Association	Children and Adolescents	<ul style="list-style-type: none"> All children age 2 and older should participate in at least 30 minutes of enjoyable, moderate-intensity physical activities every day that are developmentally appropriate and varied. All children and adolescents should participate in at least 60 minutes of moderate to vigorous physical activity every day.
National Association for Sport and Physical Education (2004)	Children	<ul style="list-style-type: none"> Age and developmentally appropriate activity: <ul style="list-style-type: none"> Accumulate at least 60 minutes, and up to several hours, on all or most days, including moderate and vigorous physical activity with majority of time spent in intermittent activity Several bouts lasting 15 minutes or more each day Variety of age-appropriate physical activity to achieve optimal health, wellness, fitness and performance benefits Discourage extended periods of inactivity ≥ 2 hours
Centers for Disease Control (CDC)	Children and Adolescents	<ul style="list-style-type: none"> Children and adolescents should do 60 minutes (1 hour) or more of physical activity each day <ul style="list-style-type: none"> Aerobic activity should make up most of the 60 or more minutes of physical activity each day. This can include either moderate-intensity aerobic activity, such as brisk walking, or vigorous-intensity activity, such as running. Be sure to include vigorous-intensity aerobic activity on at least 3 days per week. Include muscle strengthening activities, such as gymnastics or push-ups, at least 3 days per week as part of the 60 or more minutes. Include bone strengthening activities, such as jumping rope or running, at least 3 days per week as part of the 60 or more minutes.

Even with the documented benefits of regular physical activity, many children still remain inactive or do not meet the physical activity recommendations for their age group. Based on the results from the 2007 national Youth Risk Behavior Survey, only 35% of high school

students meet the recommended level of physical activity (40). Furthermore, the prevalence of students participating in 60 minutes of daily physical activity decreases as grade level increases. The prevalence of having met the recommended level of physical activity was higher among 9th grade students (38.1%) than 10th grade students (34.8%) than 11th grade students (34.8%) and 12th grade students (29.5%). Similarly, a study conducted by Strauss et al (89) reported a significant decline in physical activity levels between ages 10 to 16 years. The study also reported that the youth participants spent 75.5% of the day inactive, with 5.2 ± 1.8 hours per day watching television, sitting at the computer, and doing homework. In contrast, children in the study spent only 1.4% of the day (12.6 ± 12.2 minutes) engaged in vigorous activity (89).

In response to the increasing number of individuals who either do not meet the physical activity recommendations or who are physically inactive, researchers have begun to focus on ways to increase physical activity in children. As part of the Healthy 2010 national health objectives, goals have been developed to help improve levels of physical activity among children (4). These health objectives, combined with specific guidelines released from the National Association for Sport and Physical Education (NASPE) regarding physical education curriculum, provide schools with targets for how to increase physical activity in children (23, 51).

2.3 THE ROLE OF SCHOOLS IN INCREASING PHYSICAL ACTIVITY FOR CHILDREN AND ADOLESCENTS

Schools have played a central role in providing opportunities for children and adolescents to participate in physical activity (72). Traditionally, students have engaged in physical activity

during physical education, recess breaks, by walking or biking to and from school, and participation in school sports. However, as we move into the 21st century, alarming health trends are emerging suggesting that schools may need to reevaluate and expand their role in providing physical activity to children and adolescents (72).

Currently, schools have an opportunity to influence and encourage participation in physical activity, promote healthy weight and provide education for a healthy lifestyle (39). According to the United States Department of Education, an estimated 55.8 million students were enrolled in elementary and secondary schools in 2007 (41). The *Surgeon General's Call to Action* report (25) identified schools as key settings to implement programs and strategies designed to address the prevalence of overweight and obesity because most children spend a large portion of time in school, schools provide many opportunities to engage children in healthy eating and physical activity and schools also provide many opportunities to reinforce healthy diet and physical activity messages.

Lee et al. (48) reported that schools play an important role in the battle against obesity. Several reasons for this approach include 1) over 95% of children and adolescents are enrolled in schools, 2) physical activity and healthy eating are an established part of school curriculums, and 3) schools with well-design and well-implemented physical education programs can effectively promote healthy behaviors such as increasing physical activity and healthy nutrition while decreasing the amount of time spent participating in sedentary activities.

Katz et al. (49) are also in support of schools serving as a key factor in the prevention of overweight and obesity children. They reported that schools offer multiple advantages for implementing programs designed to prevent and control overweight by providing continuous and intensive contact with the majority of children and adolescents in the United States. In addition,

Katz et al. suggested that school curricula, personnel, policy intervention and changes in the physical environment have the potential to promote healthful dietary practices and regular physical activity. Story et al. (39) supported these findings and added that no other institution has as much continuous and intensive contact with children during the first two decades of life. Thus, schools have a great potential to positively affect the physical activity levels and weight of children.

In 2000, *National Healthy People (HP) 2010* published objectives related to schools and physical activity. These objectives include:

- Objective 22-08: Increase the proportion of the public and private schools that require daily physical education for all students.
- Objective 22-09: Increase the proportion of adolescents who participate in daily school physical education.
- Objective 22-10: Increase the proportion of adolescents who spend at least 50% of school physical education class time being physically active.

More recently, The Institute of Medicine report, *Preventing Childhood Obesity* (50) calls for schools to help students meet at least 50% of their daily recommended physical activity during the school day.

2.4 PHYSICAL EDUCATION

Physical education instruction, which has been a part of the school curriculum since the 1800's, can increase student's knowledge, physical activity in physical education class, and physical

fitness levels (20, 73). Daily physical education from kindergarten through 12th grade is recommended by the American Heart Association (63) and NASPE (61) and is also part of the national health objectives published as part of the *National Healthy People (HP) 2010* (4), however, the minimum amounts of physical education required for students is usually set by state law. Although 94% of states and 95% of school districts require some level of physical education, only one state requires that physical education be offered daily from kindergarten through 12th grade (20).

The School Health and Policies and Programs Study (SHPPS) is a national survey that is conducted every six years by the CDC to assess school health policies and programs at the state, district, school and classroom levels (52). The results of the 2006 survey revealed that only 3.8% of elementary schools, 7.9% of middle schools and 2.1% of high schools provide daily physical education or its equivalent (150 minutes per week in elementary school and 225 minutes per week in middle or high school) for the entire school year (36 weeks) for students in all grades in the school. Only 13.7% elementary schools, 15.2% of middle schools and 3.0% of high schools provided physical education at least 3 days per week or its equivalent for the entire school year. The findings of this survey suggest that schools are not providing students with adequate opportunities to participate in physical education. In addition to the results of the SHPPS, the CDC reported that the percentage of students who attended and participated in daily physical education class has dropped from 42% in 1991 to 28% in 2003 (26). In 2003, 38% of 9th grade students, but only 18% of 12th grade students reported participating in daily physical education, which suggests that participation in daily physical education decreases with increasing grade level. The 2003 Youth Risk Behavior Surveillance Survey (YRBSS) reported that, for the 53.1% of students who attend physical education classes on 1 or more days per week,

participation was higher among 9th grade students (66.8%), as compared to 10th grade students (56.8%), 11th grade students (45.1%), and 12th grade students (41.5%). In addition, for students who attend physical education classes on a daily basis, the percentage of students who participate was found to be higher among 9th grade students (40.1%) as compared to 10th grade students (30.9%), 11th grade students (19.8%), and 12th grade students (23.8%). The combined results of these reports confirm that participation in physical education decreases with age. Because of the apparent decrease in participation in physical education as students progress through the school system, several researchers have completed interventions aimed at increasing physical activity levels in secondary students.

Jamner et al. (59) conducted Project FAB to evaluate the effect of a school-based physical activity intervention on sedentary adolescent girls. The intervention was conducted over a four-month study period during which time 10th and 11th girls in the intervention group (n=25) were offered enhanced physical education classes (Five 60-minutes classes per week: 4 physical education classes and one health class), while girls in the control group (n = 22) received their usual physical education curriculum. All participants completed clinical assessments at baseline and after 4 months. Physical activity was measured using physiological tests including: cardiovascular fitness (VO(2) peak via bicycle ergometer), body composition (via dual x-ray absorptiometer; DEXA), and body mass index (BMI). Compared to the girls in the control group, the intervention had a significant effect on cardiovascular fitness (p =.017), lifestyle activity (p =.005), and light (p =.023), moderate (p =.007), and hard (p =.006) activity levels of the girls in the intervention group.

Pate et al. (67) conducted a 2-year intervention study implemented in 24 high schools in South Carolina. The intervention consisted of several components that were designed to create an

environment that encouraged physical activity. These components included health and behavior education, as well as a 1-year physical education program aimed at developing motor skills, modeling success, encouragement, and moderate physical activity. The participants were 1604 girls (control=741, intervention=863) in 9th grade and the results of the study revealed that 45% of girls in the intervention schools and 36% of girls in the control schools reported vigorous physical activity during an average of one or more 30-minute time blocks per day over a 3-day period.

In both studies, the modifications that were made to the physical education curriculum elicited positive changes in fitness measures and time spent engaged in physical activity. The results of these studies demonstrate that school-based interventions, specifically interventions that enhance the physical education curriculum, can be successful at increasing physical activity among high school aged students.

2.4.1 Health Benefits of Physical Education

The importance of participating in regular physical activity is justified by the potential health-benefits that can be realized in children and adolescents. For example, a recent study by Datar and Sturm (71) reported an inverse association between the number of minutes that physical education is offered and BMI. Sallis et al (69) reported that improved physical education resulted in significant improvements in fitness, and fitness has been shown to have a significant impact on health-related outcomes (69).

To further define this relationship between physical activity and health-related outcomes, Carrel et al (83) conducted a study on 50 obese middle school children. For the 9 month

intervention, students were randomized to a lifestyle-focused, fitness-oriented physical education class (intervention group) or standard physical education class (control group). All of the participants underwent evaluation of fasting insulin and glucose levels, body composition and maximum oxygen consumption at baseline (before the school year) and at the end of the school year. The intervention group received increased time for physical education and was grouped into smaller class sizes than the control group. The results of the study revealed that the treatment group, when compared to the control group, demonstrated a significantly greater fat loss (loss= $-4.1\% \pm 3.4\%$ vs. $-1.9\% \pm 2.3\%$; $p=0.04$), greater increases in cardiovascular fitness ($VO_2\text{max}=2.7 \pm 2.6$ vs. $0.4 \pm 3.3\text{mL/kg per min}$; $p<0.001$) and greater improvements in fasting insulin levels (insulin level= -5.1 ± 5.2 vs. $3.0 \pm 14.3 \mu\text{IU/ml}$ [-35.4 ± 36.1 vs. $20.8 \pm 99.3 \text{pmol/L}$]; $p=0.02$). The results of this study suggest that physical activity has beneficial effects on body composition, fitness and insulin levels in children (83).

To further define the relationship between physical education and improved health outcomes, Gortmaker et al (90) conducted the Planet Health study. The purpose of this 2 year study was to evaluate the impact of a school-based health and physical education intervention on obesity among 1295 boys and girls in grades 6 to 8 enrolled in 10 different public schools (5 interventions and 5 controls). The intervention schools implemented an enhanced health and physical education curriculum, while the control schools implemented the regular school curriculum. The results of this study revealed a reduced prevalence of obesity among girls in the intervention schools when compared to the girls in the control schools (Odds Ratio= 0.47, 95%CI=0.24-0.93, $p=0.03$), with no difference found among the boys.

An 8 month intervention study was conducted in 18 prevocational secondary schools by Singh et al (84). The study recruited 978 students aged 12-13 years. The schools were randomly

assigned into either the intervention or the control group. The intervention schools offered an enhanced physical education curriculum while the control schools offered the standard curriculum. The results of the study revealed a positive significant difference in the intervention schools for the following measures: hip circumference (mean difference=0.53cm; 95%CI=0.07-0.98), sum of skin folds in girls (mean difference= - 2.31mm; 95%CI= - 4.34- - 0.28), and waist circumference in boys (mean difference= - 0.57cm; 95%CI= - 1.10- -0.05).

The results of these studies demonstrate that physical activity may be important for improving health-related outcomes such as body mass, cardiovascular fitness and insulin levels in children and adolescents (69, 71, 83, 84, 90).

2.5 QUALITY PHYSICAL EDUCATION PROGRAMS

As reported by Story, Kaphingst and French (39), the quality of physical education is critical to improving the health status of children and adolescents. Currently, only one third of adolescents are physically active in their physical education class for more than 20 minutes 3 to 5 days per week. To address this issue, several organizations including the CDC and NASPE have published reports that define a quality physical program and provide guidelines for schools to follow for developing a quality physical education program.

In the CDC's report *Guidelines for School and Community Programs to Promote Lifelong Physical Activity among Young People* (20), physical education curriculum and instruction is identified as a key component to a school health program. The CDC recommends that students should be participating in daily physical education, as well as a quality program,

that provides an opportunity for all students to develop knowledge and skills needed to establish and maintain a physically active lifestyle (20).

In accordance with the ideas presented in the CDC's report, NASPE has developed its own definitions for physical education and quality physical education program. NASPE defines physical education as a curricular component within the structure of a school that focuses on students learning about physical activity and gaining motor skills and health-related fitness (23, 51). As stated in the position paper *What Constitutes a Quality Physical Education Program* (51), NASPE suggests that today's physical education programs are important because they should be providing students with learning experiences that meet individual developmental needs, which help to improve mental alertness, academic performance, readiness to learn and enthusiasm for learning. NASPE has developed guidelines to help schools develop and implement quality physical education programs that meet these goals.

According to these guidelines, a quality physical education program includes the following components: instruction time, teacher qualifications and professional development and adequate facilities. NASPE further defines each of these critical elements and recommends that to have a quality physical education program high schools should offer instructional periods totaling 225 minutes of physical education per week, employ qualified physical education specialists to provide a developmentally appropriate program, and ensure that physical education classes have access to adequate facilities. These components were used to help guide the development of the 2006 *Shape of the Nation Report* (42), for which NASPE partnered with the American Heart Association (AHA) to develop establish specific criteria that can be used to expand and improve physical education programs. The first critical element is to offer an adequate amount of time (i.e. 150 minutes per week for elementary school students and 225

minutes per week for middle and high school students) for physical education at every grade, K-12. The second critical element is to ensure that physical education is delivered by certified/licensed physical education teachers in an appropriate play space. In addition to the development of these criteria, the second goal of the 2006 *Shape of the Nation Report* was to gather information and report the current mandates currently in effect for each of the 50 state education agencies and the District of Columbia.

Based on these critical elements and the recommendations from NASPE, several studies (69-71, 74-78) have been conducted to investigate the impact that these critical elements (instruction time for physical education, teacher training and development, and adequate facilities) have on improving physical education curriculum and increasing physical activity among students.

2.5.1 Instruction Time

As one of the elements critical to a quality physical education program, NASPE recommends that schools offer physical education to high school students for a minimum of 225 minutes per week. Although there is no specific data to explain the significance, this number may be related to a generic class length (45 minutes) and the recommendation for daily physical education (45 minutes per day x 5 days per week = 225 minutes per week).

Based on data collected from the 2006 *Shape of the Nation Report* (42), 83% of states (42 states) mandate physical education for high schools. Among those states that do mandate physical education for high school students, 76% do not mandate the specific grade levels during which physical education must be taken. For the 24% of schools that do mandate the specific

grade levels, 100% require physical education in 9th grade, 90% require it in 10th grade, 70% require it in 11th grade and 60% require it in 12th grade. In addition, the majority of states do not mandate a certain number of minutes of physical education per week. Only 20% (10 states) mandate the number of minutes offered to high school students per week. Among these 10 states, only three states (Indiana, Montana, and South Carolina) and the District of Columbia meet the national recommendation of 225 minutes or more minutes per week (42). With the knowledge that most states and schools do not achieve the recommended time component of the NASPE guidelines, several studies have been conducted to determine the impact of instruction time for physical education on physical activity levels.

A recent study conducted by Datar and Sturm (71) investigated the effects of physical education instruction time on BMI change in elementary schools. Their study followed a nationally representative cohort of 9751 kindergartners as they moved to first grade and was exposed to an additional hour of physical education as compared with the time allowed for physical education in kindergarten. The results of the study found that increasing the amount of time for physical education by 60 minutes reduced BMI among girls who were overweight or at risk for overweight in kindergarten ($p<.001$) but had no significant effect among overweight or at-risk-for-overweight boys ($p=0.25$) or among boys ($p=0.31$) or girls ($p=0.80$) with a normal BMI. The results of this study are significant because they suggest that simply increasing the number of minutes that physical education is offered to students may be enough to positively impact BMI.

Similar to the Datar and Sturm, Veugelers and Fitzgerald (74) conducted a study to investigate the correlation between weight status and participation in physical education classes. This study was part of the 2003 Children's Lifestyle and School-performance survey conducted

on 4298 5th grade students, their parents and school principals in Nova Scotia. The results of the study revealed that participation in physical education classes two or more times per week was associated with a decreased risk of overweight (Odds Ratio = 0.61, 95%CI=0.43-0.87) and obesity (Odds Ratio =0.54, 95%CI=0.33-0.88) (74).

The Sports, Play, and Active Recreation for Kids (SPARK) conducted by Sallis et al (69) investigated the differences in the amount of physical activity offered per week and instructor training on physical activity levels and selected fitness measures in fourth and fifth grade elementary school students. Seven schools were assigned to three different conditions: health-related physical education classes taught by a certified physical education specialist, health-related physical education classes taught by a classroom teacher who received additional training to implement the specific curriculum, or a control condition where the standard curriculum was taught by a classroom teacher who received no additional training. Results of this study revealed that students spent more time per week being physically active in specialist-led classes (40 minutes) and teacher-led classes (33 minutes) when compared to control classes (18 minutes: $p<0.001$). After completion of the two year study, girls in the specialist-led classes were superior to the girls in the control classes on abdominal strength and endurance ($p<0.001$) and cardio respiratory endurance ($p<0.001$). There were no significant results between the boys in the different classes (69).

The results of these studies demonstrate that increased instruction time may be important for enhancing physical education curriculum and that an enhanced curriculum may provide students with increased opportunities to participate in physical activity.

2.5.2 Teacher Qualifications and Professional Development

As suggested in the previous section by Sallis et al. (69), teacher training and professional development may also be important to developing a quality physical education program. Results of the SPARK study found that students spent more time per week being physically active and experienced significant improvements in fitness measures in physical education classes that were led by physical education teachers who received additional training when compared to physical education teachers who received no additional training and regular classroom teachers.

McKenzie et al (70) conducted the Middle-School Physical Education Intervention (M-SPAN) study, whose purpose was to develop, implement and assess a health-related physical education intervention in middle school aged students. Twenty-four middle schools (approximately 25,000 students) were recruited to participate in the study with 12 intervention and 12 control schools. The intervention consisted of the implementation of an enhanced physical education curriculum that focused on health-related activities and teacher training. At the conclusion of the two-year period, it was noted that the intervention significantly ($p=0.02$) improved student moderate to vigorous physical activity (MVPA) in physical education, by approximately 3 minutes per lesson. It was also noted that these effects were cumulative; by year 2 the students in the intervention schools increased MVPA by 18% (70).

Similar to the M-SPAN study, McKenzie et al (75) conducted the Child and Adolescent Trial for Cardiovascular Health (CATCH) study, which investigated the effect of a modified physical education curriculum delivered by physical education teachers who received additional training on the level (low, moderate, or vigorous) of physical activity among elementary school students. Results of this study revealed that students in the interventions schools who received

the modified physical education curriculum lead by teachers who received additional training engaged in more moderate-to-vigorous physical activity than students in the control schools ($p=0.02$). Students in the intervention schools also participated in 12 more minutes of moderate to vigorous physical activity ($p=0.003$) and performed better by running 18.6 yards more than children in the control schools during a 9-minute run test ($p=0.21$) (75).

To support the results of these studies, the CDC suggests in the report *Guidelines for School and Community Programs to Promote Lifelong Physical Activity among Young People* (20), that the planning, implementation and evaluation of physical education programs requires specially trained personnel. Physical education specialists teach longer lessons, spend more time on developing skills, impart more knowledge and provide more moderate and vigorous physical activity than do classroom teachers (73).

In response to the results of studies like these and the recommendations from the CDC and NASPE, school districts and state have begun to evaluate and establish new requirements for physical education teachers. Based on data collected from the 2006 *Shape of the Nation Report* (42), the majority of schools (80.6%) require newly hired physical education teachers to have an undergraduate or graduate training in physical education or related field, and 73.2% of schools require new teachers to be state certified, licensed or endorsed. In addition, funding for professional development was offered in 66% of the states and 80.7% of the districts. In 89.3% of the schools, physical educators received staff development on at least one physical education topic within the last two years.

2.5.3 Instructional Facilities

The third element critical to a quality physical education program, as recommended by NASPE, is access to appropriate instructional facilities for all physical education classes. NASPE along with the Joint Commission for National Health Education Standards note that adequate facilities and equipment are necessary for physical education programs to be successful in offering all students opportunities for increased physical activity (20). NASPE also recommends that school districts adopt policies to ensure that physical education spaces are strictly for the use of physical education classes during their assigned class times and that classes are not cancelled due to the use of the space by another program (23). In support of the recommendations issued by NASPE and the Joint Commission for National Health Education Standards, the results of the 2006 School Health and Policies and Programs Study (58) suggest that the availability of indoor and outdoor physical education facilities may determine the quality of physical education. Nationwide, more than three fourths of all high schools had access to a gymnasium, weight room, baseball or softball field, general use field, and soccer or football field for physical education (58).

Several studies have been conducted to examine the relationship between the availability of instructional facilities for physical education and physical activity. The study conducted by Haug et al (76) investigated this relationship in 1347 8th grade students in 68 secondary schools in Norway. The results of this study revealed that students who attended schools with many facilities had 4.49 times (95%CI=1.93-10.44) higher odds of being physically active compared to students in schools with fewer facilities. It was also reported that facilities such as open fields (Odds Ratio=4.31, 95%CI=1.65-11.28), outdoor obstacle course (Odds Ratio=1.78,

95%CI=1.32-2.40), playground equipment (Odds Ratio=1.73, 95%CI=1.24-2.42) and room with cardio and weightlifting equipment (Odds Ratio=1.58, 95%CI=1.18-2.10) were associated with increased participation in physical activity (76).

A second study conducted by Haug et al (77) examined the association between physical environmental characteristics and participation in daily physical activity during school breaks. Data was collected from 16,471 students in grades 4-10 in 130 schools through self administered questionnaires to the principals and students. Results of the study revealed that boys who attended schools with a higher number of outdoor facilities had 2.69 times (95%CI=1.21-5.98) higher odds of being physically active when compared to boys in schools with fewer facilities. Similar results were found in female students. Girls that attended schools with a higher number of outdoor facilities had 2.90 times (95%CI=1.32-6.37) higher odds of being physically active when compared to girls in schools with fewer facilities.

To support the data collected from Haug's studies, Sallis et al (78) conducted a study to assess the association of school environmental characteristics with student physical activity. Data was collected from 24 public middle schools in California through direct observation before school, after lunch and after schools. The results of the study revealed that students in schools with a high number of facilities were more active than students in schools with a low number of facilities. The environmental characteristics of the school, including number of facilities, explain 42% of the variance in the proportion of girls who were physically activity and 59% of the variance for boys (78).

The results of these studies demonstrate that specific components of the NASPE guidelines such as access to instructional facilities may be important for enhancing physical education. Although it is important to understand which components may have the greatest

impact on improving physical education curriculum, it also important to determine what factors may affect schools ability to improve these specific components. This information is critical to developing and implementing quality physical education programs in schools.

2.6 FACTORS INFLUENCING PHYSICAL ACTIVITY IN PHYSICAL EDUCATION

Although NASPE (51) along with other organizations (61-64) endorse frequent and effective physical education in schools, it appears that most children do not engage in adequate physical activity during school. Very few studies have examined the reasons for the lack of physical activity in school. A critical step in the design of quality physical education programs that deliver increased opportunities for physical activity is careful understanding of the factors that may affect the schools ability to implement such a program (80).

A study conducted by Barroso et al (80) described the barriers to quality physical education curriculum as reported by elementary physical education specialists trained as part of the CATCH program. The data was from four consecutive annual surveys (2000-2004) that were collected from 157 teachers. The combined results from these surveys revealed that significant barriers exist to providing quality physical education. The teachers reported that large class sizes, inadequate indoor and/or outdoor facilities and insufficient numbers of physical education specialists were among the major obstacles (80). Other reported barriers included low priority of physical education compared to other academic subjects and limited financial resources. Several other studies also found similar barriers to implementing quality curriculum.

The *Tennessee Class Size Project* (85) is a three-phase study designed to determine the effect of smaller class size in grades K-3 on short-term and long-term pupil performance. The first phase of this project, termed Project STAR (for Student-Teacher Achievement Ratio), was a four-year study designed to assess the effectiveness of small classes (13-17 students) compared with regular classes (22-25 students) taught with the help of a teacher's aide and regular classes (22-25 students) with no aid. Scores for both standardized and curriculum-based tests were collected during kindergarten, first, second and third grade years for 6500 students in 330 classrooms in 80 school districts. Analysis of these test scores revealed that smaller classes did produce substantial improvements in early learning and cognitive studies. The second phase of the project was called the *Lasting Benefits Study* and was designed to follow this same cohort of students to determine whether the perceived benefits of smaller class sizes continued into later grades. Observations made as a part of this phase confirmed that the children who were originally enrolled in smaller classes continued to perform better than their peers in the same grade (who were originally enrolled in larger classes) when they were returned to regular-sized classes in later grades. Under the third phase, Project Challenge, the 17 economically poorest school districts were given small classes in kindergarten, first, second, and third grades. These districts improved their end-of-year standing in rank among the 139 districts from well below average to above average in reading and mathematics. The results of this landmark class size study suggest that smaller class sizes produce improvements in academic performance.

Although very little research exists to determine if the benefits of smaller class sizes translate into participation in physical activity during physical education, the CDC recommends in its report *Guidelines for School and Community Programs to Promote Lifelong Physical*

Activity among Young People (20), that schools adopt policies to ensure that student-to-teacher ratios in physical education are comparable to those in other subjects.

To investigate the effect of location on physical activity, Springer et al (81) conducted a study to examine the prevalence of physical activity and sedentary behaviors in a probability sample of students in 4th, 8th, and 11th grades by urban, suburban and rural locations. Data was collected from the 2004-2005 School Physical Activity and Nutrition (SPAN) study. The results of the study revealed that urban 8th and 11th grade students reported the lowest prevalence of physical activity. Students in suburban or rural schools were significantly more likely than urban students to report higher school-based team sport participation in 8th graders ($p=0.001$), higher vigorous physical activity ($p=0.01$) and strength training exercises ($p=0.01$) in 11th grade boys. Attendance in physical education was also higher among urban 4th grade ($p<0.01$) and urban 11th grade ($p=0.05$) students. Participation in sports teams ($p=0.04$) and other organized physical activity ($p=0.04$) was higher in urban 4th grade girls. Participation in vigorous physical activity was higher in urban 8th grade boys ($p=0.04$) when compared to the other students. The results of this study suggest significant differences in participation in physical activity by local status (81).

Similar to Springer, Butcher et al (79) conducted a study to assess the rates and correlates of adolescents' compliance with guidelines for physical activity. The variables examined included: race/ethnicity, income level, geographic region, and parental education level. A phone survey was used to gather self-reported physical activity data from 1625 adolescents ages 14-17. The parents of each adolescent also participated in the phone survey to answer demographic questions. Results of the survey revealed that compliance among adolescents who lived in a household with a higher household income (above \$60,000) was significantly associated with compliance of the physical activity guidelines ($p = 0.03$), although there was not a significant

relationship between compliance and low or middle income. This suggests that a relationship may exist between socioeconomic status and participation in physical activity levels (79).

To support the research similar to that of Springer and Butcher, Jones et al (82) conducted a study to examine the effect factors such as location, schools size and school type have on schools in the United States implementing health promoting policies, programs, and facilities. The data used for the study was collected from the School Health Policies and Programs Study 2000. The following variables were used to group the schools: school type (public, private, or Catholic), urbanicity (urban, suburban, or rural), and school enrollment size. The results of this study revealed that public schools (vs. private and Catholic schools), urban schools (vs. rural and suburban schools) and schools with larger enrollments (vs. smaller schools) had more health-promoting policies, programs and facilities in place. These results are significant because they suggest that students who attend these schools may have access to higher quality programs including physical education than students who attend schools with fewer resources.

2.7 SIGNIFICANCE

Improving the quality of physical education is necessary to achieve potential health-benefits in the child and adolescent populations (5, 63). The results of studies from Sallis et al (69) and Carrell et al (83) help to demonstrate that a quality physical education program may be important for improving health-related outcomes such as body mass, cardiovascular fitness and insulin levels in children and adolescents.

To help define and guide the development of quality physical education programs, NASPE has developed specific criteria including the following components: instruction time, teacher qualifications and professional development and adequate facilities. As presented in this chapter, there is evidence to support that each of these components can affect the quality of physical education delivered in school settings. However, what is unclear is the ability of schools to achieve these components of the NASPE physical education guidelines and whether there are demographic characteristics of the school that may affect the ability of the school to implement these guidelines as recommended. This information may be valuable in understanding how to improve the quality of physical education across schools representing diverse communities with diverse characteristics, and may lead to the development of interventions and policies to facilitate the implementation of these recommendations to improve the quality of physical education in high schools. To help understand the relationship of these factors on the development of a quality physical education program, a conceptual model was developed (Figure 1). This model was used to guide the development of the proposed study.

This primary focus of this study was to describe components such as instruction time, teacher qualifications and facilities available to support physical education in high schools (10th, 11th, 12th grades) located in southwestern Pennsylvania, and to determine whether there are demographic characteristics of the school (locale, size, SES status) that affect these components.

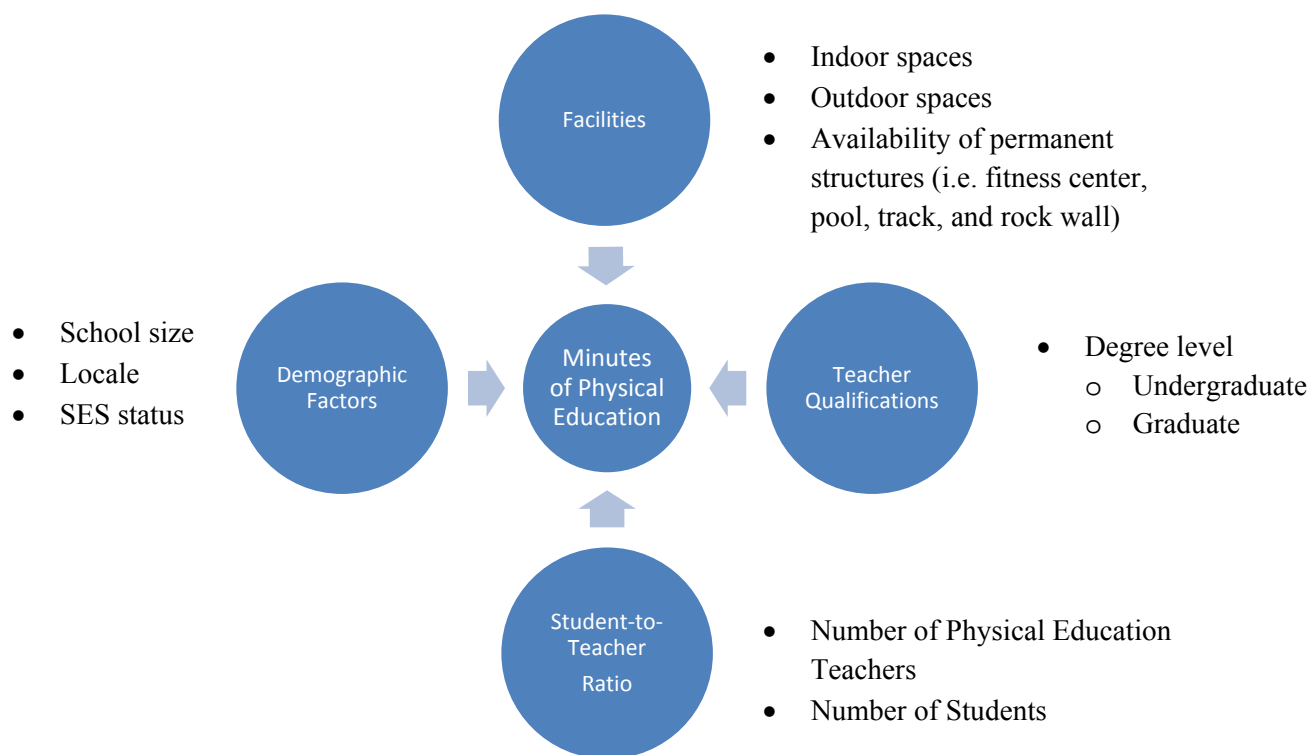


Figure 1: Conceptual Model

3.0 METHODS

3.1 INTRODUCTION

Physical activity has been shown as an effective way to improve the weight status of children and adolescents. Participation in regular physical activity has been shown to help control body weight, maintain healthy bones and reduce the risk for developing chronic diseases such as cardiovascular disease, hypertension, and diabetes mellitus (26). The current public health recommendation is for children to participate in 60 minutes of daily physical activity (9).

Although schools may not allow students the opportunity to accumulate all of the recommended minutes of physical activity, they do offer opportunities for children and adolescents to become active.

Within the school environment, physical education has been targeted as the most effective way to increase physical activity among students (25, 39). For students to benefit from the increased amounts of physical activity, schools need to offer quality physical education programs that provide opportunities for students to meet the recommended daily amount of physical activity. To help schools develop quality physical education programs, the National Association for Sport and Physical Education (NASPE) has developed a set of guidelines to provide schools with specific criteria to help increase opportunities for students to meet the recommended daily amount of 225 minutes per week of physical activity, ensure that the individuals delivering the physical education are qualified, and ensure that there is appropriate

safe space for physical education to be administered. However, it is unclear if schools are achieving any or all of these guidelines. Additionally, it is important to examine whether there are factors that affect their ability to meet these guidelines. This primary focus of the study was to describe components such as instruction time, teacher qualifications and facilities available to support physical education in high schools (10th, 11th, 12th grades) located in southwestern Pennsylvania, and to determine whether there are demographic characteristics of the school (locale, size, SES status) that affect these components.

3.2 EXPERIMENTAL DESIGN

A quantitative, cross-sectional study design was used to examine factors that may influence the ability of high schools in Southwestern Pennsylvania to achieve the physical education curriculum criteria established by NASPE. The physical education curriculum data for this study was collected using an electronic survey.

The sequence for the methods of this study is described below.

1. Step 1: An invitation letter (Appendix A) and electronic survey was distributed electronically to the Physical Education Department Chairperson or the physical education designate assigned by the school district.
 - a. A reminder (Appendix B) letter was sent 2 weeks after the initial letter.
 - b. If no response was received, a phone call was made (Appendix C) and recipients were given the option to complete the survey via the telephone.
 - c. A follow-up phone call was made 2 weeks after the initial phone call.

2. Step 2: The survey was completed two weeks after the fourth contact attempt was made.

3.3 STUDY POPULATION

There are 91 public high schools in Allegheny, Beaver, Indiana and Westmoreland Counties.

The demographic data, organized by county, is shown in Table 2. All of the public high schools in these counties were recruited to participate in this study. The recruitment procedures are described in detail below.

Table 2: Demographic Information of Target Population Summarized by County

County	Total # of Schools	PIAA Classification				Free & Reduced Lunch	Locale Codes*							
		A	AA	AAA	AAAA	Average %	1	2	3	4	5	6	7	8
Allegheny	51	9	13	13	16	31.4	10	0	39	0	0	0	0	2
Beaver	14	4	7	3	0	33.6	0	0	9	0	0	0	0	5
Indiana	8	7	0	1	0	36.7	0	0	0	1	0	1	6	0
Westmoreland	18	3	4	7	4	25.6	0	0	10	0	0	0	0	8

** The locale codes have been defined and established by the National Center of Education Statistics. All Pennsylvania schools have been classified using this coding system: 1 (large city), 2 (mid-size city), 3(urban fringe of a large city), 4 (urban fringe of a mid-size city), 5 (large town), 6 (small town), 7 (rural outside a Metropolitan Core Based Statistical Area), and 8 (rural inside a Metropolitan Core Based Statistical Area).*

3.4 RECRUITMENT PROCEDURES

The physical education department chairperson or designated high school physical education teacher for each of the 91 schools was invited to participate in the study via a letter that provided an overview of the study. The letter also indicated that if school policy required the investigator to seek approval from the Principal, Superintendent, or other school entity prior to conducting the study the Physical Education teacher should inform the investigator of this so that the approval could be obtained prior to conducting the study. This letter was sent electronically to the physical education department chairperson or the high school physical education teacher representing each of the recruited schools.

The list of public high schools along with their address and phone number was obtained from the Pennsylvania Department of Education (PDE). The PDE supports the Education Names and Addresses (EdNA) program which may be used to find the names, addresses, administrators, and related information about the educational entities that are served by the PDE. The EdNA program can be accessed online (<http://www.edna.ed.state.pa.us/>) and allows users to download reports that contain the information described above. The email addresses for the physical education department chairperson or designated high school physical education teacher were obtained directly from each school's website, which is provided as a link from the PDE website. If the department chairperson was not identified on the school's website or if email addresses were not listed, a phone call was made to the school district to obtain this information.

If the department chairperson for physical education or designated physical education teacher did not respond within two weeks to the invitation letter and electronic survey, a reminder letter was sent electronically. If the contacted teacher did not respond to the second

letter, a phone call attempt was made. One additional phone call was made if the contacted teacher did not respond to the first phone attempt. If the contacted teacher did not respond after four requests, two by email and two by phone; it was assumed that the teacher was not interested in participating in the study.

3.5 PHYSICAL EDUCATION SURVEY

An invitation letter and electronic survey (Appendix A) was distributed to the physical education department chairperson or the individual designated by the school district. The letter provided a description of study including approximate duration and the nature of tasks, the type of information that would be collected and an explanation of how confidentiality would be maintained. In addition, the letter explained that participation was voluntary and that individuals could withdraw at any time. The process for informed consent was handled in accordance with the IRB of the University of Pittsburgh procedures and guidelines. Recipients who agreed to participate in the survey were instructed to follow the directions listed in the letter to access the self-administered electronic survey. Recipients who did not wish to participate were instructed not to click on the link to the web address for the survey. Recipients also had the ability to exit the survey at any time without submitting their responses. Participants of the survey were instructed that the survey would take approximately 10-15 minutes to complete and that they should complete the survey within two weeks of receiving it. Participants were also informed that they must complete the survey at one time as they were not able to re-enter the survey once they exited.

3.5.1 Instrument

The instrument that was used in this study was a survey developed by the researcher based on an existing questionnaire used by NASPE to evaluate quality physical education programs (see Section 3.5.2 for validity and reliability procedures). Initial contact was made via an introduction letter that was sent to each school district along with the instructions for accessing the survey. The purpose of the letter was to invite the recipient to participate in the research study, provide a brief overview of the study, explain the consent process, and outline how confidentiality would be maintained. Recipients who agreed to participate were instructed to follow the directions for accessing the web address for the electronic survey. The survey was self-administered and was completed during one online session. Participants were not able to re-enter the survey after they exited it.

The advantages to issuing a self-administered online survey include: being able to cover a large geographic area, the survey can be completed at the convenience of the respondent, and the survey can be distributed and completed quickly. The potential disadvantages of a self-administered online survey include: respondent must have internet/email access, the respondent must have a certain level of computer expertise, respondent may have limited or no access to the researcher for troubleshooting or question clarification (46).

In addition this survey method was chosen based on its use and acceptance in educational research. Conducted by NASPE and the American Heart Association (AHA) in 2006, the Shape of the Nation Report was a large scale audit of physical education programs across all 50 states and the District of Columbia. Data for this report was collected using a mixed-mode approach of

an online questionnaire and follow-up phone calls. This method, which was the same used in this study, resulted in a 100% response rate.

The survey was made available to the respondents via the online survey system Student Voice. The Student Voice is an online service offered through the Applied Research Laboratory (ARL) at Indiana University of Pennsylvania. The ARL, which has been in operation since 1982, is a statistics consulting center that offers access to a variety of services and resources related to research design and analysis. The ARL provides technical assistance to faculty, staff, students, administrators, and those of the general public engaged in research. The ARL handles approximately 75 projects per year and since its inception has had no reported issues with protocol compliance or participant confidentiality.

After obtaining approval from the University of Pittsburgh Institutional Review Board and Indiana University of Pennsylvania Institutional Review Board, the survey was sent to the Student Voice where the survey was formatted and a web account to store the survey was created. The department chairperson or the physical education teacher designated by the school district for each of the recruited schools was provided with the web address for the survey. The response to the survey by each respondent was managed by Student Voice, who assigned one consultant to work on this study. All collected data was stored electronically and locked with passwords to restrict access. As the data was being collected, only the assigned consultant had access to the information. The computers are located in a locked office in a secure building. As it was received from the respondents, the data was compiled in SPSS. Once all of the surveys were completed, the Student Voice consultant sent the SPSS data file to the researchers for analysis. The SPSS data file sent to the researchers was de-identified.

The self-administered online survey contained demographic questions and closed-ended questions. The inclusion of closed-ended questions provided more reliable results that were easy to interpret and score, while the demographic information questions provided details regarding the school district and the surrounding community (46).

The survey contained questions that addressed specific components of the physical education program that was currently being delivered to secondary students within the school. The survey questions addressed specific areas such as time requirements for physical education, teacher qualifications and professional development, and instructional facilities. These areas of interest were determined according to the NASPE guidelines for a high quality physical education program. The identified individual at each school was asked to respond to each of the statements on the survey. This survey is shown in Appendix D and contained questions in the following areas:

- The amount of physical education instruction time offered to students in grades 10, 11, and 12.
- Whether students in grades 10, 11, and 12 receive formal instruction in physical education for at least 3 class periods per week.
- The academic training of the physical education faculty.
- The physical education student-to-teacher ratio for grades 10, 11, and 12.
- The number of spaces (indoor, outdoor, and permanent structures) available for physical education classes.

3.5.2 Survey Validity and Reliability

The survey validity was reviewed by a panel of 12 experts in the field of physical education and curriculum design. The panel of experts included previous secondary physical educators, previous physical education department chairpersons, and individuals involved in both pedagogy and physical education departments in higher education. The survey was distributed to this panel two times during the development process. The survey was sent to each expert, who had two weeks to review the survey and make comments. Based on the feedback and comments of these experts, the survey was modified to ensure that the survey questions were accurately addressing the desired content. The revised survey was redistributed to the panel, which again had two weeks to review the survey. The second round of comments and suggestions from the panel was used to determine the final form of the survey.

Prior to distributing the finalized survey to the targeted schools, a pilot study was conducted to test the reliability of the survey. For the pilot study, the survey was sent to 18 schools that were randomly selected to participate in the pilot study. The pilot schools were similar in demographics (i.e. school size, locale and SES status) to the schools in the target population. The purpose of the pilot study was to examine question clarity and general question format. The results of the pilot were used to help ensure that the results of the survey were reliable.

A test of internal consistency was conducted after the survey had been distributed to and returned by the pilot schools. This test was used to determine the relationship of specific questions within the survey. The type of reliability test used was Cronbach's Alpha. This measure of internal consistency provides data to determine the reliability of the testing

instrument such that questions of similar characteristics produce similar results. An example may be examining the answers for having sufficient teachers in a school district as compared to student to teacher ratio. This instrument compares questions on a survey in every possible manner and produces correlation values for them all.

3.6 STATISTICS

The data that was collected from the surveys were organized in tables generated using Microsoft Excel 2007 and were analyzed using the statistical program SPSS 16.0. Prior to analysis, the data was tested to meet the assumptions of the statistical test being used.

Descriptive data offers summaries of the target population and the content area of interest. This type of data was organized using graphic analysis such as charts and graphs. Simple statistics were also used to gain a better understanding of the target population. Descriptive statistics included frequencies such as numbers and percentages, central tendency such as the mean, median and mode, and measures of variation such as range and standard deviation (46).

Correlation analysis was used to examine the relationship between the student-to-teacher ratio and the number of minutes that physical education is offered to students per year in selected public high schools in Southwestern Pennsylvania. Correlation analysis was also used to examine the relationship between the number of teachers with an undergraduate or graduate degree in physical education and the number of minutes that physical education is offered and also to examine the relationship between the number of facilities available to support physical education and the number of minutes physical education is offered.

Repeated measures analysis of variance was used, for specific aims 4-6, to determine if the teacher to-student ratio, teacher qualifications, or the number of facilities available to support physical education differs by school size, locale, or SES status. Moreover, regression analysis was used to determine the influence of school size, locale, and SES status on the number of minutes physical education is offered and the student-to-teacher ratio, teacher education or facilities available to support physical education.

4.0 RESULTS

4.1 INTRODUCTION

This study focused on describing the instruction time for physical education and the influence of the physical education student-to-teacher ratio, qualifications of physical education teachers, and physical education facilities on instruction time for physical education. In addition, this study examined the influence of school characteristics (school size, school locale, and SES status of the school) on physical education student-to-teacher ratio, physical education teacher qualifications, and physical education facilities.

4.2 RELIABILITY OF THE STUDY SURVEY INSTRUMENT

As described in Chapter 3, a survey instrument specific for this study was developed, and a pilot study was conducted to assess the reliability of this survey instrument. Eighteen schools from the study population of 91 total schools were selected at random to participate in this pilot study. Fifteen of the 18 schools (83.3%) completed the survey. The Cronbach's alpha was used to measure the internal consistency of the survey and this analysis revealed a score of .707. Only 13 of the initial 15 schools that responded to the survey completed the survey a second time to allow for test-retest reliability analysis. The raw data for physical education instruction time, physical education teacher qualifications, and physical education facilities are shown in Tables

3a, 3b, and 3c, respectively. The test/retest correlation was .979. Based on these results it was determined that the survey met acceptable criteria for reliability to proceed with the recruitment of additional schools for this study.

Table 3a. Comparison of Test and Re-Test Scores for Category of Minutes of Physical Education per Week for the Entire School Year by Individual School

School	10 th Grade Category of Minutes Per Week		11 th Grade Category of Minutes Per Week		12 th Grade Category of Minutes Per Week	
	Test	Retest	Test	Retest	Test	Retest
1	30-59	30-59	30-59	30-59	30-59	30-59
2	60-89	60-89	60-89	60-89	60-89	60-89
3	60-89	60-89	60-89	60-89	60-89	60-89
4	60-89	60-89	60-89	60-89	60-89	60-89
5	150-179	150-179	150-179	150-179	150-179	150-179
6	60-89	30-59	60-89	30-59	60-89	30-59
7	30-59	30-59	30-59	30-59	30-59	30-59
8	>180	>180	>180	>180	>180	>180
9	90-119	90- 119	90-119	90-119	90-119	90- 119
10	90-119	90- 119	90-119	90-119	90-119	90- 119
11	150-179	150-179	150-179	150-179	150-179	150-179
12	90-119	120-149	90-119	90-119	90-119	120-149
13	>180	>180	>180	>180	>30	>30

Table 3b: Comparison of Test and Re-Test Scores for Qualifications of Physical Education Teachers by Individual School

School	Teachers with Undergraduate Degree		Teachers with Graduate Degree	
	Test	Retest	Test	Retest
1	3	3	2	3
2	6	6	2	7
3	5	5	1	1
4	5	5	2	2
5	3	3	2	2
6	6	6	4	7
7	1	1	6	6
8	6	6	1	1
9	4	4	2	2
10	6	6	7	7
11	3	3	2	2
12	4	4	3	3
13	4	4	1	1

Table 3c: Comparison of Test and Re-Test Scores for Total Number of Physical Education Facilities by Individual School

School	Total Number of Facilities		Number of Indoor Spaces		Number of Outdoor		Number of Outdoor		Swimming Pool (No=0, Retest)	Track and Field (No=0, Retest)	Climbing Wall (No=0, Retest)	Fitness Center (No=0, Retest)				
	Test	Retest	Test	Retest	Test	Retest	Test	Retest								
1	6	7	3	4	1	1	1	1	0	0	0	0	1	1		
2	17	18	6	8	5	5	2	1	1	1	1	1	1	1		
3	19	20	6	6	2	3	8	8	1	1	1	1	0	0	1	1
4	6	6	2	2	1	1	1	1	0	0	1	1	0	0	1	1
5	13	14	2	2	2	2	8	8	0	0	0	1	0	0	1	1
6	11	12	3	3	2	3	2	2	1	1	1	1	1	1	1	1
7	16	17	4	5	1	1	8	8	1	1	1	1	0	0	1	1
8	7	7	2	2	1	1	1	1	1	1	1	1	0	0	1	1
9	11	9	3	4	4	2	2	1	1	1	1	1	0	0	0	0
10	21	22	8	8	7	7	2	3	1	1	1	1	1	1	1	1
11	13	14	2	2	2	2	8	8	0	0	0	1	0	0	1	1
12	12	12	4	4	4	4	1	1	1	1	1	1	0	0	1	1
13	10	11	3	3	4	3	2	3	0	0	1	1	0	0	0	1

4.3 RECRUITMENT OF SCHOOLS TO TEST THE SPECIFIC AIMS FULL TRIAL

There are 91 public high schools in Allegheny, Beaver, Indiana, and Westmoreland Counties, which is the area from which schools were proposed to be recruited. Initial outreach to these schools to identify a Physical Education Department Chairperson or other designated physical education teacher to contact regarding participation in this study resulted in a response rate of 83 out of the 91 schools (91.2%). Thus, the invitation letter and electronic survey were sent to the Physical Education Department Chairperson or other designated physical education teacher at these 83 schools, with 39 schools partially or fully completing the survey, for a response of 46.98%. When considered based on the sample of 91 possible schools, the response was 42.9%.

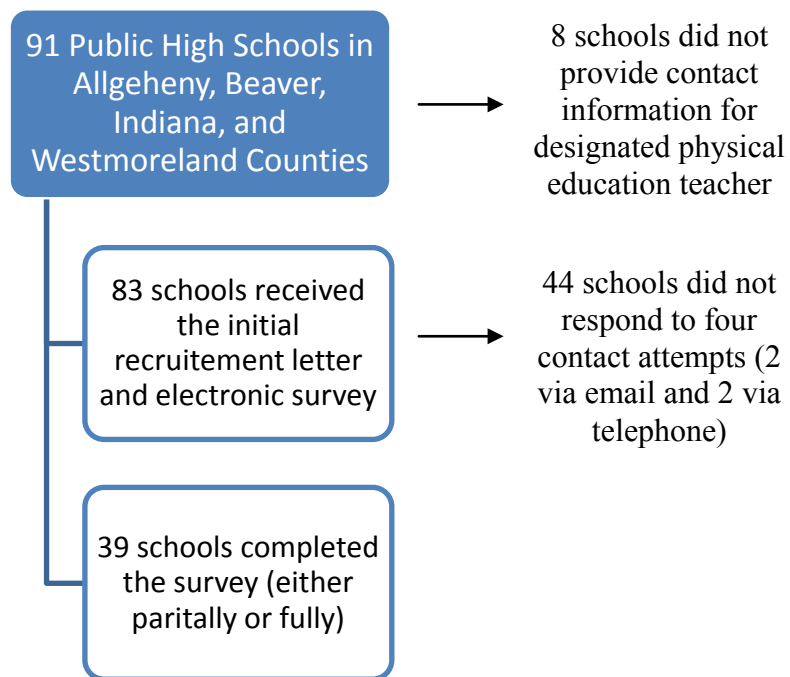


Figure 2: Recruitment of Schools

4.3.1 Characteristics of Respondents to the Survey

Of the 39 respondents, 23 (59.0%) were physical education teachers, 15 (38.5%) were physical education department chairpersons (38.5%) and 1 (2.6%) responded in the category of “other”, which was left undefined (see Table 4). Table 5 provides a summary of the respondents’ number of years in education. Those with the most experience (20 years or more) accounted for the largest group of respondents making up 41.0% of the sample. Those with the least amount of experience (2-4 years) accounted for 15.4% of the respondents with those with 8-10 years of education experience accounting for 12.8% of the respondents. The categories of 5-7, 11-13, 14-16, and 17-19 years of experience each accounted for less than 10% of the respondents.

Table 4: Current Role of Respondents

		Frequency	Percent of Total Respondents
Current Role	Physical Education Department Chairperson	15	38.5
	Physical Education Teacher	23	59.0
	Other	1	2.6
	Total (N)	39	100.0

Table 5: Respondent's Total Number of Years in Education

	Frequency	Percent
Years in Education 2-4 years	6	15.4
5-7 years	3	7.7
8-10 years	5	12.8
11-13 years	3	7.7
14-16 years	3	7.7
17-19 years	3	7.7
20 years or more	16	41.0
Total (N)	39	100.0

4.3.2 School Characteristics

Table 6 summarizes the demographic information including school size, locale and SES status of the schools that responded to the survey and the schools that did not respond to the survey. A chi-square test of independence was calculated to determine if there was a significant difference in school size, locale or SES status between respondents and non-respondents of the survey. No significant difference was found between respondents and non-respondents for school size(χ^2 (3) =5.99, $P>.05$), locale (χ^2 (5) =6.33, $P>.05$), or SES status (χ^2 (5) =3.55, $P>.05$).

Table 6: Demographic Information for the Respondent Schools and Non-Respondent Schools

		Respondent (N=39)		Non-Respondent (N=52)	
		Frequency	Percent	Frequency	Percent
School Size by PIAA Class	A	9	23	14	27
	AA	7	18	17	33
	AAA	10	26	14	27
	AAAA	13	33	7	13
School Locale	Large city	3	8	7	14
	Urban fringe of a large city	24	61	34	65
	Urban fringe of a mid-size city	0	0	1	2
	Small Town	0	0	1	2
	Rural, outside CBSA*	5	13	1	2
	Rural, inside CBSA*	7	18	8	15
SES Status	Low (1-14.79%)**	15	39	11	21
	Middle (14.8-32.29%)**	11	28	16	31
	High (32.3-100%)**	13	33	25	48

***CBSA = Core Based Statistical Area**

****Indicates based on tertiles the percent of students within a school receiving a free and reduced price lunch.**

4.3.3 Physical Education Curriculum Characteristics of Responding Schools

Student-to-Teacher Ratio. The student-to-teacher ratio was calculated within each school for grades 10, 11, and 12. Data are presented in Table 7. Results of a within-subjects repeated measures analysis of variance showed no difference between the student-to-teacher ratio for 10th grade (76.8±55.7 students per teacher), 11th grade (65.6±37.8 students per teacher) and 12th grade (66.2±38.8 students per teacher) (p=.110).

Table 7: Student-to-Teacher Ratio by Grade Level

	10 th Grade (N=35*)	11 th Grade (N=35*)	12 th Grade (N=35*)
Students per Physical Education Teacher	76.8±55.7	65.6±37.8	66.2±38.8
Range	240.0	154.0	160.0
Minimum	16.0	15.0	16.5
Maximum	256.0	169.0	176.5
Median	59.0	55.0	60.0
Mode	44.4	51.0	38.0

*(While 39 respondents completed the survey, only 35 answered these questions).

NOTE: No significant difference between grades.

Days of Physical Education per Week for the Entire School Year. The instruction time for physical education within each of the study schools was collected for each grade level (10, 11, and 12). Respondents answered questions addressing the number of days per week that physical education was offered to students in each of the three grade levels for the entire school

year and also the number of minutes per week for the entire school year that physical education was offered to students in grades 10-12. The frequency distribution for the number of physical education classes offered per week per year within each school for grades 10-12 are shown in Table 8. The number of days per week that physical education was offered in 10th, 11th, and 12th grade was 2.8 ± 1.4 , 2.7 ± 1.4 , and 2.5 ± 1.4 days per week per year, respectively. Results of a within-subjects repeated measures analysis of variance showed no difference between the number of physical education classes offered per week for the entire school year for grades 10, 11 and 12 ($P=.135$). Data are presented in Table 9. For students in grade 10, 34.2% of schools reported that physical education is most frequently offered two days per week. A similar result was found for the upper two grade levels, where 35.1% of schools reported that physical education is offered two days per week to students in 11th and 12th grades.

Table 8. Frequency Distribution for the Number of Physical Education Classes Offered Per Week for the Entire Year within Each School by Grade Level

Physical Education Classes Per Week Within Each School	10 th Grade (N=38*)		11 th Grade (N=37*)		12 th Grade (N=37*)	
	Frequency of Schools	Percent of Schools	Frequency of Schools	Percent of Schools	Frequency of Schools	Percent of Schools
1	7	18.4	8	21.6	9	24.3
2	13	34.2	13	35.1	13	35.1
3	7	18.4	8	21.6	8	21.6
4	0	0	0	0	0	0
5	11	28.9	8	21.6	7	18.9

*While 39 respondents completed the survey, only 38 answered the 10th grade questions and 37 answered the 11th and 12th grade questions.

Table 9: Number of Physical Education Classes Offered Per Week for the Entire Year by Grade Level

	10 th Grade (N=35*)	11 th Grade (N=35*)	12 th Grade (N=35*)
PE Classes Per Week for the Entire School Year	2.8±1.5	2.7±1.4	2.5±1.4
Range	4.0	4.0	4.0
Minimum	1.0	1.0	1.0
Maximum	5.0	5.0	5.0
Median	2.0	2.0	2.0
Mode	2.0	2.0	2.0

*(While 39 respondents completed the survey, only 35 answered these questions).

NOTE: No significant difference between grade levels.

Minutes of Physical Education per Week. Table 10 shows the number of minutes per week that physical education is offered within each school to students in grades 10-12 for the entire school year. For students in grade 10, 21.1% of the schools reported offering greater than 180 minutes per week of physical education for the entire school year, with 21.1% of schools offering physical education for 60-89 minutes per week for the entire school year. For students in grade 11 and 12, the majority of schools (24.3%) reported that physical education is most frequently offered 60-89 minutes per week for the entire school year. Data were also analyzed to compare the minutes per week between grade levels. This required the data to be recoded to 29 min/wk for the <30 minute category, the midpoints of the range were used for the 30-59, 60-89, 90-119, 120-149, and 150-179 minute categories, and 80 min/wk was used for the >180 minute

category. Data are shown in Table 11. A within-subjects repeated measures ANOVA revealed no significant difference for minutes of physical education instruction per week between the 10th (104.9±54.3 min/wk), 11th (100.1±55.1 min/wk), and 12th (92.3±53.4 min/wk) grades (P=0.23).

Table 10. Frequency Distribution for the Minutes of Physical Education Offered per Week for the Entire Year within Each School by Grade Level

Reported Minutes Per Week	10 th Grade (N=38*)		11 th Grade (N=37*)		12 th Grade (N=37*)	
	Frequency of Schools	Percent of Schools	Frequency of Schools	Percent of Schools	Frequency of Schools	Percent of Schools
< 30 minutes	5	13.2	6	16.2	7	18.9
30-59 minutes	4	10.5	4	10.8	5	13.5
60-89 minutes	8	21.1	9	24.3	9	24.3
90-119 minutes	7	18.4	5	13.5	5	13.5
120-149 minutes	3	7.9	3	8.1	3	8.1
150-179 minutes	3	7.9	3	8.1	3	8.1
>180 minutes	8	21.1	7	18.9	5	13.5

*While 39 respondents completed the survey, only 38 answered the 10th grade questions and 37 answered the 11th and 12th grade questions.

Table 11: Number of Minutes of Physical Education Offered Per Week for the Entire Year by Grade Level

	10 th Grade (N=38*)	11 th Grade (N=37*)	12 th Grade (N=37*)
Minutes of Physical Education Offered Per Week for the Entire School Year	104.9±54.3	100.1±55.1	92.3±53.4
Range	151.0	151.0	151.0
Minimum	29.0	29.0	29.0
Maximum	180.0	180.0	180.0
Median	104.5	74.5	74.5
Mode	74.5	74.5	74.5

*(While 39 respondents completed the survey, only 35 answered these questions).

NOTE: No significant difference between grade levels.

Academic Training of Physical Education Teachers. To address the teacher qualifications within each school, respondents were asked to answer questions regarding the number of physical education teachers who have undergraduate or graduate degrees in physical education. Table 12 reports the number of teachers within each of the study schools that have an undergraduate or graduate degree. The percent of schools report having 5 or more teachers with an undergraduate degree in physical education was 34.3, whereas 28.6% of schools report that none of their teachers have a graduate degree in physical education. As presented in Table 13, the mean percentage of teachers within a school having an undergraduate degree in physical education was 96.9±14.6% and the mean percentage of teachers within each school with a graduate degree in physical education was 65.0±34.8%.

Table 12. Frequency Distribution of the Number of Physical Education Teachers with Undergraduate or Graduate Degrees within Each School

Number of Physical Education Teachers Within the School	Teacher(s) with an Undergraduate Degree		Teacher(s) with a Graduate Degree	
	Frequency of Schools	Percent of Schools	Frequency of Schools	Percent of Schools
Zero	1	2.9	10	28.6
1	0	0	7	20.0
2	8	22.9	4	11.4
3	8	22.9	7	20.0
4	6	17.1	0	0
5	0	0	0	0
5 or more	12	34.3	2	5.7
Uncertain	0	0	5	14.3
Total (N)	35*	100.0	35*	100.0

*While 39 respondents completed the survey, only 35 answered these questions.

Table 13: Percent of Physical Education Teachers with an Undergraduate Degree or Graduate Degree within Each School

	Undergraduate Degree (N=35*)	Graduate Degree (N=35*)
Percent of Teachers within Each School	96.9±14.6%	65.0±34.8%
Range	83.3	123.3
Minimum	16.7	16.7
Maximum	100.0	140.0
Median	100.0	66.7
Mode	100.0	66.7

*While 39 respondents completed the survey, only 35 answered these questions.

Facilities Available for Physical Education. Respondents reported the facilities available for physical education and summary data of this information is presented in Table 14. Of the schools providing information to these questions (N=35), 100% of the schools reported having indoor spaces available for physical education and 94.3% of these schools reported that they also have outdoor grass spaces available for physical education. The majority of schools also reported having access to a track (71.4%), fitness center (68.8%), and outdoor concrete spaces (62.9%). The climbing wall (34.3%) and swimming pool (42.9%) were identified as the least available facilities for physical education.

Table 14. Facilities Available to Support Physical Education Within Each School for Physical Education.

Facilities	Facility Available		Facility Not Available	
	Frequency of Schools	Percent of Schools	Frequency of Schools	Percent of Schools
Indoor Spaces	35	100		
Outdoor Grass Spaces	33	94.3	2	5.7
Track	25	71.4	10	28.6
Fitness Center	24	68.6	11	31.4
Outdoor Concrete Spaces	22	62.9	13	37.1
Swimming Pool	15	42.9	20	57.1
Climbing Wall	12	34.3	23	65.7

4.4 ANALYSIS OF DATA TO EXAMINE SPECIFIC AIM 1: TO EXAMINE THE RELATIONSHIP OF THE PHYSICAL EDUCATION STUDENT-TO-TEACHER RATIO AND THE NUMBER OF MINUTES PHYSICAL EDUCATION IS OFFERED PER WEEK FOR THE ENTIRE SCHOOL YEAR IN SELECTED PUBLIC HIGH SCHOOLS IN SOUTHWESTERN PENNSYLVANIA.

Data for the student-to-teacher ratio were skewed and physical education minutes were scored as a categorical variable. Therefore, Spearman Rank Correlation Coefficients were computed to examine the relationship between the physical education student-to-teacher ratio and minutes physical education is offered per week for the entire school year in selected public high schools

in Southwestern Pennsylvania. The correlation matrix is shown in Table 15. There were no significant correlations between student-to-teacher ratio and minutes of physical education for 10th grade ($r_{\text{ranks}}=-0.14$, $p=0.41$), 11th grade ($r_{\text{ranks}}=-0.04$, $p=0.83$), or 12th grade ($r_{\text{ranks}}=0.03$, $p=0.85$). These results suggest that the student-to-teacher ratio does not significantly affect the minutes of physical education that is offered within the 10th, 11th, or 12th grades in the schools participating in this study.

Table 15. Spearman Rank Correlation Coefficients Between the Physical Education Student-to-Teacher Ratio and Minutes of Physical Education Per Week for the Entire School Year by Grade Level.

Student-to-Teacher Ratio		Physical Education Minutes per Week		
		10 th Grade (N=35*)	11 th Grade (N=35*)	12 th Grade (N=35*)
10 th Grade	r_{ranks}	-0.143		
	p-value	.412		
11 th Grade	r_{ranks}		-0.038	
	p-value		.829	
12 th Grade	r_{ranks}			0.034
	p-value			.848

*While 39 respondents completed the survey, only 35 answered these questions.

4.5 ANALYSIS OF DATA TO EXAMINE SPECIFIC AIM 2: TO EXAMINE THE RELATIONSHIP OF NUMBER TEACHERS WITH AN UNDERGRADUATE OR GRADUATE DEGREE IN PHYSICAL EDUCATION AND THE NUMBER OF MINUTES OF PHYSICAL EDUCATION OFFERED IN SELECTED PUBLIC HIGH SCHOOLS IN SOUTHWESTERN PENNSYLVANIA.

Due to the categorical nature of the data, Spearman Rank Correlations were computed to examine the relationship between the physical education teacher qualifications (graduate degree or undergraduate degree training) and the category of minutes of physical education offered per week for the entire school year. The correlation matrix is shown in Table 16. There was no significant relationship between the number of physical education teachers with an undergraduate degree and minutes of physical education offered per week for the entire school year for 10th grade ($r_{\text{rank}} = 0.16$, $p=0.35$), 11th grade ($r_{\text{rank}}=0.32$, $p=0.06$), or 12th grade ($r_{\text{rank}}=0.25$, $p=0.15$). Non-significant relationships were also found between the number of physical education teachers with a graduate degree and minutes of physical education offered per week for 10th grade ($r_{\text{rank}} = -0.14$, $p=0.41$), 11th grade ($r_{\text{rank}}=0.004$, $p=0.98$), or 12th grade ($r_{\text{rank}}=-0.03$, $p=0.88$). There was no significant relationship between the percent of physical education teachers within each school with an undergraduate degree and minutes of physical education offered per week for the entire school year for 10th grade ($r_{\text{rank}} = -0.161$, $p=0.051$), 11th grade ($r_{\text{rank}}=0.313$, $p=0.067$), or 12th grade ($r_{\text{rank}}=0.288$, $p=0.093$). Non-significant relationships were also found between the percent of physical education teachers with a graduate degree and minutes of physical education offered per week for 10th grade ($r_{\text{rank}} = -0.14$, $p=0.355$), 11th grade ($r_{\text{rank}}=-0.058$, $p=0.741$), or 12th grade ($r_{\text{rank}}=-0.074$, $p=0.672$). These results suggest that teacher qualifications do not significantly affect the minutes of physical education that is offered within the 10th, 11th, or 12th grades in the schools participating in this study.

Table 16. Spearman Rank Correlation Coefficients between the Physical Education Teacher Qualifications Within Each School and Minutes of Physical Education Per Week for the Entire School Year by Grade Level.

Teacher Qualifications		Physical Education Minutes per Week		
		10 th Grade (N=35*)	11 th Grade (N=35*)	12 th Grade (N=35*)
Number of Teachers Within each School with Undergraduate Degree	r_{rank}	0.163	0.324	0.246
	p-value	0.350	0.058	0.154
Number of Teachers Within each School with Graduate Degree	r_{rank}	-0.143	0.004	-0.026
	p-value	0.412	0.981	0.884
Percent of Teachers Within each School with an Undergraduate Degree	r_{rank}	0.332	0.313	0.288
	p-value	0.051	0.067	0.093
Percent of Teachers Within each School with a Graduate Degree	r_{rank}	-0.161	-0.058	-0.074
	p-value	0.355	0.741	0.672

*While 39 respondents completed the survey, only 35 answered these questions.

4.6 ANALYSIS OF DATA TO EXAMINE SPECIFIC AIM 3: TO EXAMINE THE RELATIONSHIP OF FACILITIES AVAILABLE TO SUPPORT PHYSICAL EDUCATION AND THE NUMBER OF MINUTES OF PHYSICAL EDUCATION OFFERED IN SELECTED PUBLIC HIGH SCHOOLS IN SOUTHWESTERN PENNSYLVANIA.

Due to the categorical nature of the data, Spearman Rank Correlations were computed to examine the relationship between facilities available for physical education and the category of minutes of physical education offered per week for the entire school year. The correlation matrix

is shown in Table 17. There was no significant relationship between the total number of facilities available to support physical education and minutes of physical education offered per week for the entire school year for 10th grade ($r_{\text{rank}} = 0.047$, $p = 0.790$), 11th grade ($r_{\text{rank}} = 0.202$, $p = 0.244$), or 12th grade ($r_{\text{rank}} = 0.091$, $p = 0.603$). Non-significant relationships were found between the minutes of physical education offered per week for the entire school year and each of the specific categories of activity facilities available in the school (indoor spaces, outdoor grassy spaces, outdoor concrete spaces, availability of a swimming pool, availability of a track and field, availability of a rock climbing wall, fitness center) for 10th, 11th, or 12th grade. These results suggest that the facilities available to support physical education do not significantly affect the minutes of physical education that is offered within the 10th, 11th, or 12th grades in the schools participating in this study.

Table 17. Spearman Rank Correlation Coefficients between the Facilities Available Within Each School to Support Physical Education and Minutes of Physical Education Per Week for the Entire School Year by Grade Level.

Facilities		Physical Education Minutes per Week		
		10 th Grade (N=35*)	11 th Grade (N=35*)	12 th Grade (N=35*)
Total Facilities	r_{rank}	0.047	0.202	0.091
	p-value	0.790	0.244	0.603
Indoor Spaces	r_{rank}	-.117	0.041	0.154
	p-value	0.505	0.817	0.378
Outdoor Grassy Spaces	r_{rank}	0.0.93	0.129	-0.012
	p-value	0.0.93	0.462	0.947
Outdoor Concrete Spaces	r_{rank}	0.102	0.326	0.247
	p-value	0.561	0.056	0.152
Swimming Pool	r_{rank}	0.009	0.055	0.017
	p-value	0.960	0.753	0.921
Track and Field	r_{rank}	0.029	-0.035	0.041
	p-value	0.871	0.842	0.814
Rock Climbing Wall	r_{rank}	0.079	0.136	-0.100
	p-value	0.654	0.436	0.569
Fitness Center	r_{rank}	0.130	0.062	-0.062
	p-value	0.457	0.724	0.725

*While 39 respondents completed the survey, only 35 answered these questions.

4.7 ANALYSIS OF DATA TO EXAMINE SPECIFIC AIM 4

4.7.1 Analysis of Data to Test Hypothesis 4a: It is hypothesized that larger high schools, when compared to smaller high schools, will have a lower physical education student-to-

teacher ratio and this will result in more minutes of physical education minutes being offered to students per year in these high schools.

Categories of minutes per week that physical education was offered were recoded to 29 min/wk for the <30 minute category, the midpoints of the range were used for the 30-59, 60-89, 90-119, 120-149, and 150-179 minute categories, and 180 min/wk was used for the >180 minute category. A two-factor (Grade X School Size) repeated measures ANOVA was performed and revealed no significant Grade Effect, School Size Effect, or Grade X School Size Interaction Effect for minutes of physical education offered. These data are shown in Table 18. In addition the parametric tests, non-parametric tests were also used. Results of the Kruskal-Wallis H Test revealed no significant difference between school size and physical education instruction time offered in 10th grade ($H(3) = .577, p=.902$), 11th grade ($H(3) = .245, p=.970$), or 12th grade ($H(3) = 3.464, p=.325$).

Data for the analysis of student-to-teacher ratio for physical education by grade level (10th, 11th, and 12th) between school sizes (A, AA, AAA, and AAAA) are presented in Table 19. There was a significant effect of school size on student-to-teacher ratio with small schools having a lower student-to-teacher ratio for physical education than larger schools. However, there was a non-significant effect of grade level on the student-to-teacher ratio, which also resulted in a non-significant Grade X School Size interaction effect. In addition to the parametric tests, non-parametric tests were also used.

Table 18. Repeated Measures Analysis of Variance (ANOVA) to Compare Minutes of Physical Education Per Week by Grade Level Between Classifications of School Size.

Grade Level	School Size Categories				Grade	p-values	
	A (N=9)	AA (N=6)	AAA (N=10)	AAAA (N=12)		School Size	Grade X School Size
10 th grade	111.3±65.3	101.9±47.0	104.5±49.7	95.8±56.2	0.213	0.938	0.115
11 th grade	97.8±62.7	101.9±47.0	106.1±55.7	95.8±59.7			
12 th grade	66.0±45.2	101.9±47.0	106.1±55.7	95.8±59.1			

Table 19. Repeated Measures Analysis of Variance (ANOVA) to Student-to-Teacher Ratio by Grade Level Between Classifications of School Size.

Grade Level	School Size Categories				Grade	p-values	
	A (N=9)	AA (N=6)	AAA (N=8)	AAAA (N=12)		School Size	Grade X School Size
10 th grade	31.7±10.2	54.2±20.9	75.9±31.4	122.4±66.8	0.224	<0.001	0.350
11 th grade	29.0±8.2	48.5±20.9	73.4±21.8	96.4±39.3			
12 th grade	40.0±28.5	42.0±14.2	70.5±24.0	95.1±42.4			

Linear regression analysis was performed to examine the relationship between minutes of physical education offered and the student-to-teacher ratio controlling for school size. Dummy variables were entered into the model to control for school size. Results of this analysis showed a non-significant partial correlation of -0.16 ($p=0.38$) between the 10th grade minutes of physical education and the 10th grade student-to-teacher ratio controlling for school size. A non-significant partial correlation of -0.25 ($p=.17$) was found between the 11th grade minutes of physical education and the 11th grade student-to-teacher ratio controlling for school size. A non-significant partial correlation of -0.31 ($p=.08$) was also found between the 12th grade minutes of physical education and the 12th grade student-to-teacher ratio controlling for school size. These results suggest that school size does not influence the relationship between the minutes of physical education offered in 10th, 11th, or 12th grades in the schools participating in this study and the student-to-teacher ratio.

4.7.2 Analysis of Data to Test Hypothesis 4b: It is hypothesized that high schools with a locale of “urban fringe of a large city” will have a lower physical education student-to-teacher ratio and this will result in more minutes of physical education being offered to students per year in these high schools compared to high schools in other locale classifications.

A two-factor (Grade X School Size) repeated measures ANOVA was performed and revealed a non-significant Grade Effect, School Locale Effect, and Grade X School Locale Interaction Effect for minutes of physical education offered. These data are shown in Table 20. In addition the parametric tests, non-parametric tests were also used. Results of the Kruskal-Wallis H Test revealed no significant difference between school locale and physical education instruction time

offered in 10th grade ($H(3) = 1.110, p = .775$), 11th grade ($H(3) = 3.680, p = .298$), or 12th grade ($H(3) = 5.315, p = .150$).

Data for the analysis of student-to-teacher ratio for physical education by grade level (10th, 11th, and 12th) between school locales are presented in Table 21. There was a non-significant Grade Effect, School Locale Effect, and Grade X School Locale Interaction Effect for student-to-teacher ratio.

Table 20. Repeated Measures Analysis of Variance (ANOVA) to Compare Minutes of Physical Education Per Week by Grade Level Between School Locales.

Grade Level	Large City (N=3)	School Locale Categories			p-values		
		Urban Fringe of a Large City (N=22)	Rural Outside CBSA (N=5)	Rural Inside CBSA (N=7)	Grade	School Locale	Grade X School Locale
10 th grade	119.3±78.2	103.8±47.8	80.5±62.7	108.9±63.1	0.145	0.381	0.100
11 th grade	119.3±78.2	104.5±52.2	56.3±32.7	108.9±63.1			
12 th grade	119.3±78.2	104.5±52.2	59.4±30.1	65.8±47.4			

Table 21. Repeated Measures Analysis of Variance (ANOVA) to Student-to-Teacher Ratio by Grade Level Between School Locales.

Grade Level	School Locale Categories				p-values		
	Large City (N=3)	Urban Fringe of a Large City (N=22)	Rural Outside CBSA (N=5)	Rural Inside CBSA (N=7)	Grade	School Locale	Grade X School Locale
10 th grade	83.0±72.1	91.5±61.3	34.3±8.7	56.0±30.3	0.326	0.071	0.723
11 th grade	57.0±46.7	78.7±38.0	30.4±5.4	49.9±29.9			
12 th grade	64.0±59.4	74.7±39.9	34.6±4.7	62.0±38.7			

Linear regression analysis was performed to examine the relationship between minutes of physical education offered and student-to-teacher ratio controlling for school locale. Dummy variables were entered into the model to control for school locale. Results of this analysis showed a non-significant partial correlation of -0.27 ($p=0.14$) between the 10th grade minutes of physical education per week for the entire school year and the 10th grade student-to-teacher ratio controlling for school locale. A non-significant partial correlation of -0.33 ($p=.07$) was found between the 11th grade minutes of physical education and the 11th grade student-to-teacher ratio controlling for school locale. A non-significant partial correlation of -0.30 ($p=.10$) was also found between the 12th grade minutes of physical education and the 12th grade student-to-teacher ratio controlling for school locale. These results suggest that school locale does not influence the relationship between the minutes of physical education offered to 10th, 11th and 12th grade students in the schools participating in this study and the student-to-teacher ratio.

4.7.3 Analysis of Data to Test Hypothesis 4c: It is hypothesized that high schools with a lower percentage of students receiving free or reduced lunch will have a lower physical education student-to-teacher ratio and this will result in more minutes of physical education being offered to students per year in these high schools compared to high schools with a higher percentage of students receiving free or reduced lunch.

A two-factor (Grade X School SES Status) repeated measures ANOVA was performed and revealed a non-significant Grade Effect, School SES Status Effect, and Grade X School SES Status Interaction Effect for minutes of physical education offered. These data are shown in Table 22. In addition the parametric tests, non-parametric tests were also used. Results of the Kruskal-Wallis H Test revealed no significant difference between school SES status and physical education instruction time offered in 10th grade ($H(2) = 4.824, p=.090$), 11th grade ($H(2) = 3.661, p=.160$), or 12th grade ($H(2) = 2.033, p=.362$).

Data for the analysis of student-to-teacher ratio for physical education by grade level (10th, 11th, and 12th) between tertiles of SES status based on percentage of students receiving free and reduced lunch are presented in Table 23. There was a significant effect of school SES status on the student-to-teacher ratio with those with higher percentages of students receiving free and reduced lunch having a higher student-to-teacher ratio. However, there was a non-significant effect of grade level on the student-to-teacher ratio, which also resulted in a non-significant Grade X School SES Status interaction effect.

Table 22. Repeated Measures Analysis of Variance (ANOVA) to Compare Minutes of Physical Education Per Week by Grade Level Between School SES Status.

Grade Level	School SES Status (tertiles of percent of students receiving free and reduced lunch)			Grade	p-values	
	Lowest Tertile (1% to <14.8%) (N=13)	Middle Tertile (14.8% to <32.3%) (N=11)	Highest Tertile (32.3% to 100%) (N=13)		School SES Status	Grade X School Locale
10 th grade	81.3±44.7	96.3±47.3	130.0±58.5	0.248	0.089	0.698
11 th grade	76.7±45.2	103.2±53.6	120.7±60.1			
12 th grade	76.7±45.2	89.5±51.3	110.3±60.7			

Table 23. Repeated Measures Analysis of Variance (ANOVA) to Compare the Student-to-Teacher Ratio by Grade Level Between School SES Status.

Grade Level	School SES Status (tertiles of percent of students receiving free and reduced lunch)			Grade	p-values	
	Lowest Tertile (1% to <14.8%) (N=12)	Middle Tertile (14.8% to <32.3%) (N=11)	Highest Tertile (32.3% to 100%) (N=12)		School SES Status	Grade X School Locale
10 th grade	101.1±63.5	70.8±56.1	57.9±40.2	0.149	0.034	0.991
11 th grade	88.8±40.6	59.2±34.7	48.3±26.9			
12 th grade	87.0±44.7	63.4±34.8	48.0±26.7			

Linear regression analysis was performed to examine the relationship between minutes of physical education offered and student-to-teacher ratio controlling for school SES status based

on percent of students receiving free and reduced lunch. Percent of students receiving free and reduced lunch was controlled in the analysis as a continuous variable. Results of this analysis showed a non-significant partial correlation of -0.07 ($p=0.71$) between the 10th grade minutes of physical education offered to students per week for the entire year and the 10th grade student-to-teacher ratio controlling for school SES status. A non-significant partial correlation of 0.02 ($p=.91$) was found between the 11th grade minutes of physical education and the 11th grade student-to-teacher ratio controlling for SES status. A non-significant partial correlation of 0.03 ($p=.86$) was also found between the 12th grade minutes of physical education and the 12th grade student-to-teacher ratio controlling for SES status. These results suggest that school SES status does not influence the relationship between the minutes of physical education offered to 10th, 11th and 12th grade students in the schools participating in this study and the student-to-teacher ratio.

4.8 ANALYSIS OF DATA TO EXAMINE SPECIFIC AIM 5

4.8.1 Analysis of Data to Test Hypothesis 5a: It is hypothesized that larger high schools, when compared to smaller high schools, will have more teachers with an undergraduate or graduate degree to teach physical education and this will result in more minutes of physical education minutes being offered to students per week for the entire year in these high schools.

As presented in section 4.6.1, a two-factor (Grade X School Size) repeated measures ANOVA was performed and revealed no significant Grade Effect, School Size Effect, or Grade X School

Size Interaction Effect for minutes of physical education offered. These data are shown in Table 18. Results of the non-parametric test, Kruskal-Wallis H Test, revealed a non-significant difference between physical education instruction time and school size.

A one-way ANOVA was computed to compare the differences in teacher qualifications as determined by the number of teachers with an undergraduate degree or graduate degree in physical education within each school and the percent of teachers with an undergraduate degree or graduate degree in physical education within each school and school size. As shown in Table 24, a significant difference was found for the number of teachers with an undergraduate degree within each school ($F(3, 31) = 2.923, p = .049$). Post-hoc comparisons using the LSD test indicated that for the number of teachers with an undergraduate degree for PIAA class A schools (3.8 ± 1.1) was significantly lower when compared to PIAA class AAAA schools (5.3 ± 1.5). However, there was no significant difference between the percent of teachers with an undergraduate degree ($F(3, 31) = .522, p = .671$) between school size classifications. Moreover, there was no significant differences found for the number of teachers with a graduate degree ($F(3, 31) = .877, p = .464$) or the percent of teachers with a graduate degree ($F(3, 31) = .149, p = .929$) between school size classifications.

Table 24. One-Way Analysis of Variance (ANOVA) to Compare Physical Education Teacher Qualifications within Each School by Classifications of School Size.

Teacher Qualifications	School Size Categories				F value	p-value
	A (N=9)	AA (N=6)	AAA (N=8)	AAAA (N=12)		
Number of Teachers with Undergraduate Degree	3.8 ± 1.1 ^a	4.0 ± 1.1	4.8 ± 1.0	5.3 ± 1.5 ^a	2.923	0.049
Percent of Teachers with Undergraduate Degree	100.0±.0	95.8±10.2	100.0±.0	93.1±24.1	0.522	0.671
Number of Teachers with Graduate Degree	2.3 ± 1.9	3.0 ± 2.3	3.3 ± 2.1	3.8±2.2	0.877	0.464
Percent of Teachers with Graduate Degree	58.2±28.7	66.7±36.8	67.1±38.5	68.1±39.1	0.149	0.929

Note: Values with the same superscript within each grade level are significantly different at $p<0.05$.

Linear regression analysis was performed to examine the relationship between minutes of physical education offered and the number of teachers with an undergraduate or graduate degree within each school. Dummy variables were entered into the model to control for school size. Results of this analysis showed non-significant partial correlation between the number of physical education teachers with an undergraduate degree and minutes of physical education offer in the 10th grade (.245, $p=.176$), 11th grade (.345, $p=.053$), or 12th grade (.184, $p=.312$). Non-significant partial correlations were also found for the number of physical education

teachers with a graduate degree and minutes of physical education offered in the 10th grade (-.105, $p=.566$), 11th grade(.000, $p=1.000$), or 12th grade (-.148, $p=.420$).

The linear regression analysis was also performed to examine the relationship between minutes of physical education and the percent of teachers within each school with undergraduate or graduate degrees. Results of this analysis showed non-significant partial correlation between the percent of physical education teachers with an undergraduate degree and minutes of physical education offer in the 10th grade (.239, $p=.187$), 11th grade (.233, $p=.201$), or 12th grade (.252, $p=.165$). Non-significant partial correlations were also found for the percent of physical education teachers with a graduate degree and minutes of physical education offered in the 10th grade (-.130, $p=.478$), 11th grade(-.051, $p=.780$), or 12th grade (-.119, $p=.518$). These results suggest that school size does not influence the relationship between teacher qualifications and the number of minutes physical education is offered to students in grades 10, 11, and 12 in schools participating in this study.

4.8.2 Analysis of Data to Test Hypothesis 5b: It is hypothesized that high schools with a locale of “urban fringe of a large city” will have more teachers with an undergraduate or graduate degree to teach physical education and this will result in more minutes of physical education minutes being offered to students in these high schools compared to high schools in other locale classifications.

As presented in section 4.6.2, a two-factor (Grade X School Size) repeated measures ANOVA was performed and revealed no significant Grade Effect, School Size Effect, or Grade X School Size Interaction Effect for minutes of physical education offered. These data are shown in Table

20. Results of the non-parametric test, Kruskal-Wallis H Test, revealed a non-significant difference between physical education instruction time and school locale.

A one-way ANOVA was computed to compare the differences in teacher qualifications within each school and school locale. As shown in Table 25, a significant difference was found for the number of teachers with an undergraduate degree within each school ($F(3, 31) = 4.795$, $p = .007$). Post-hoc comparisons using the Tukey test indicated that the number of teachers with an undergraduate degree for schools classified as “urban fringe of a large city” (5.1 ± 1.0) was significantly higher than schools classified as “rural, outside CBSA” (3.2 ± 0.4). No significant differences were found for the number of teachers with a graduate degree ($F(3, 31) = 1.040$, $p = .389$), the percent of teachers with an undergraduate degree ($F(3, 31) = 1.377$, $p = .286$), or the percent of teachers with a graduate degree ($F(3, 31) = .658$, $p = .584$).

Table 25. One-Way Analysis of Variance (ANOVA) to Compare Teacher Qualifications within Each School by Between School Locales.

Teacher Qualifications	School Locale Categories				F value	p-value
	Large City (N=3)	Urban Fringe of a Large City (N=22)	Rural Outside CBSA (N=5)	Rural Inside CBSA (N=7)		
Number of Teachers with Undergraduate Degree	4.0±0.0	5.1±1.0 ^a	3.2±0.5 ^a	3.8±1.9	4.795	0.007
Number of Teachers with Graduate Degree	3.5±0.7	3.2±2.1	1.8±0.8	4.0±3.0	1.040	0.389
Percent of Teachers with Undergraduate Degree	100.0±0.0	98.9± 5.3	100.0±0.0	86.1±34.0	1.377	0.268
Percent of Teachers with Graduate Degree	87.5±17.7	62.2±36.7	55.0±20.1	76.4±41.0	0.658	0.584

Note: Values with the same superscript within each grade level are significantly different at $p < 0.05$.

Linear regression analysis was performed to examine the relationship between minutes of physical education offered and the number of teachers with an undergraduate or graduate degree controlling for school locale. Dummy variables were entered into the model to control for school locale. Results of this analysis showed non-significant partial correlation between the number of physical education teachers with an undergraduate degree and minutes of physical education offer in the 10th grade (.203, $p = .266$), 11th grade (.290, $p = .107$), or 12th grade (.106, $p = .564$).

Non-significant partial correlations were also found for the number of physical education teachers with a graduate degree and minutes of physical education offered in the 10th grade (-.217, $p=.234$), 11th grade(-.126, $p=.493$), or 12th grade (-.133, $p=.469$).

The linear regression analysis was also performed to examine the relationship between minutes of physical education and the percent of teachers within each school with undergraduate or graduate degrees controlling for school locale. Results of this analysis showed non-significant partial correlation between the percent of physical education teachers with an undergraduate degree and minutes of physical education offer in the 10th grade (-.229, $p=.208$), 11th grade (-.154, $p=.402$), or 12th grade (-.129, $p=.483$). Non-significant partial correlations were also found for the percent of physical education teachers with a graduate degree and minutes of physical education offered in the 10th grade (.329, $p=.066$), 11th grade(.334, $p=.062$), or 12th grade (.163, $p=.374$). These results suggest the school locale does not influence the relationship between teacher qualifications and the minutes physical education is offered to grades 10, 11 and 12 in the schools that participated in this study.

4.8.3 Analysis of Data to Test Hypothesis 5c: It is hypothesized that high schools with a lower percentage of students receiving free or reduced lunch will have more teachers with an undergraduate or graduate degree to teach physical education and this will result in more minutes of physical education being offered to students in these high schools compared to high schools with a higher percent of students receiving free or reduced lunch.

As presented in 4.6.3, a two-factor (Grade X School SES Status) repeated measures ANOVA was performed and revealed a non-significant Grade Effect, School SES Status Effect, and Grade

X School SES Status Interaction Effect for minutes of physical education offered. These data are shown in Table 22. Results of the non-parametric test, Kruskal-Wallis H Test, revealed a non-significant difference between physical education instruction time and school SES status.

A one-way ANOVA was computed to compare the differences in teacher qualifications within each school and SES status. As shown in Table 26, SES status of the school did not appear to affect the number of teachers with an undergraduate degree ($F(2, 32) = .776, p=.469$), the number of teachers with a graduate degree ($F(2, 32) = 2.065, p=.143$), the percent of teachers with an undergraduate degree ($F(2, 32) = 1.560, p=.226$), or the percent of teachers with a graduate degree ($F(2, 32) = .567, p=.573$).

Table 26. One-Way Analysis of Variance (ANOVA) to Compare Teacher Qualifications within Each School by School SES Status.

Teacher Qualifications	School SES Status (tertiles of percent of students receiving free and reduced lunch)			F value	p-value
	Lowest Tertile (1% to <14.8%) (N=13)	Middle Tertile (14.8% to <32.3%) (N=11)	Highest Tertile (32.3% to 100%) (N=13)		
Number of Teachers with Undergraduate Degree	4.8 ± 1.6	4.6 ± 1.4	4.2 ± 1.0	0.776	0.469
Number of Teachers with Graduate Degree	3.9 ± 2.2	3.4 ± 2.6	2.3 ± 1.1	2.065	0.143
Percent of Teachers with Undergraduate Degree	91.0±24.5	100.0±.00	100.0± 0.0	1.560	0.226
Percent of Teachers with Graduate Degree	72.4± 38.6	65.8±37.3	57.1± 29.3	0.567	0.573

Note: Values with the same superscript within each grade level are significantly different at $p < 0.05$.

Linear regression analysis was performed to examine the relationship between minutes of physical education offered and the number of teachers with an undergraduate or graduate degree controlling for school SES status based on percent of students receiving free and reduced lunch. Percent of students receiving free and reduced lunch was controlled in the analysis as a continuous variable. Results of this analysis showed a significant partial correlation of .427

($p=.012$) between 11th grade minutes of physical education and the number of teachers with an undergraduate degree, however no other significant correlations were found. Non-significant partial correlations were found for the number of teachers with an undergraduate degree and minutes of physical education offered in the 10th grade ($.308, p=.076$) or 12th grade ($.334, p=.054$). Non-significant partial correlations were also found for the number of physical education teachers with a graduate degree and minutes of physical education offered in the 10th grade ($.023, p=.897$), 11th grade ($.148, p=.403$), or 12th grade ($.037, p=.836$).

The linear regression analysis was also performed to examine the relationship between minutes of physical education and the percent of teachers within each school with undergraduate or graduate degrees controlling for school SES status. Results of this analysis showed a non-significant partial correlation between the percent of physical education teachers with an undergraduate degree and minutes of physical education offered in the 10th grade ($-.061, p=.731$), 11th grade ($.030, p=.866$), or 12th grade ($-.017, p=.925$). Non-significant partial correlations were also found for the percent of physical education teachers with a graduate degree and minutes of physical education offered in the 10th grade ($.173, p=.327$), 11th grade ($.161, p=.363$), or 12th grade ($.149, p=.400$). These results suggest that school SES status does not influence the relationship between teacher qualifications and the minutes physical education is offered to students in 10th, 11th and 12th grades in the study schools.

4.9 ANALYSIS OF DATA TO EXAMINE SPECIFIC AIM 6

4.9.1 Analysis of Data to Test Hypothesis 6a: It is hypothesized that larger high schools will have more facilities available to support physical education and this will result in more minutes of physical education minutes being offered to students in these high schools compared to smaller high schools.

As presented in section 4.6.1, a two-factor (Grade X School Size) repeated measures ANOVA was performed and revealed no significant Grade Effect, School Size Effect, or Grade X School Size Interaction Effect for minutes of physical education offered. These data are shown in Table 18. In addition to the parametric test, the nonparametric Kruskal-Wallis H Test was used and revealed a non-significant difference between physical education instruction time and school size.

A one-way ANOVA was computed to compare the number of facilities including the total number of facilities, number of indoor spaces, number of outdoor grass spaces and the number of outdoor concrete spaces available within each school to support physical education and school size. As shown in Table 27, a significant difference was found for the number of available indoor spaces between schools based on PIAA classification ($F(3, 31) = 3.519$, $P = .026$). Post-hoc comparisons using the Tukey test indicated that for the number of available indoor spaces to support physical education within each school for PIAA class A schools (1.8 ± 0.8) was significantly lower than for PIAA class AAAA schools (3.7 ± 1.5). No significant difference was found for the total number of facilities ($F(3, 31) = 1.286$, $p = .297$), the number of

available of outdoor grass spaces ($F(3, 31) = .409, p=.748$), or the number of outdoor concrete spaces ($F(3, 31) = .1359, p=.274$).

The chi-square test of independence was used to compare the availability of facilities including a swimming pool, track, rock climbing wall and a fitness center within each school and school size. Data is presented in table 28. A significant relationship was found for the availability of a climbing wall by school size with a higher number of small schools having a climbing wall available for physical education ($\chi^2(3) = 8.185, p=.042$). No significant relationship was found between school size and the availability of a swimming pool ($\chi^2(3) = 4.318, p=.229$), the availability of a track ($\chi^2(3) = .700, p=.873$), or the availability of a fitness center ($\chi^2(3) = 1.488, p=.685$).

Table 27. One-Way Analysis of Variance (ANOVA) to Compare the Facilities Available to Support Physical Education between Classifications of School Size.

Facilities	School Size Categories				F Value	p-value
	A (N=9)	AA (N=6)	AAA (N=8)	AAAA (N=12)		
Total Facilities	7.6±2.1	9.8±4.8	9.4±3.4	10.7±4.0	1.286	0.297
Indoor Spaces	1.8±0.8 ^a	3.5±2.1	3.8±1.7	3.7±1.5 ^a	3.519	0.026
Outdoor Grass Spaces	2.6±1.2	2.8±2.4	3.2±2.3	3.4±1.8	0.409	0.748
Outdoor Concrete Spaces	0.9±0.8	0.8±0.8	0.6±0.7	1.4±1.2	1.359	0.274

Note: Values with the same superscript within each grade level are significantly different at $p<0.05$.

Table 28. Chi-Square Analysis for the Facilities Available Within Each School to Support Physical Education and School Size.

Facilities		PIAA Class A (N=9)	PIAA Class AA (N=6)	PIAA Class AAA (N=8)	PIAA Class AAAA (N=12)	χ^2 (p-value)
Swimming Pool	N*	4	3	1	7	4.318
	%*	44.4	50.0	12.5	58.3	0.229
Track and Field	N*	6	5	6	8	0.700
	%*	66.7	83.3	75.0	66.7	0.873
Rock Climbing Wall	N*	6	3	1	2	8.185
	%*	66.7	50.0	12.5	16.7	0.042
Fitness Center	N*	5	5	6	8	1.488
	%*	55.6	83.3	75.0	66.7	0.685

*Reflect schools that have these facilities available.

Linear regression analysis was performed to examine the relationship between minutes of physical education offered and the facilities available to support physical education controlling for school size. Dummy variables were entered into the model to control for school size. Results of this analysis showed a non-significant partial correlation between the minutes physical education is offered to 10th grade and the total number of facilities (.075, p=.684), the number of indoor spaces (-0.112, p=.541), the number of outdoor grassy spaces (.083, p=.651), and the number of outdoor concrete spaces (.132, p=.470). Non-significant partial correlations were also found between the minutes physical education is offered to 10th grade and the availability of a swimming pool (.088, p=.632), a track (.047, p=.798), a climbing wall (.063, p=.730), or a fitness center (.146, p=.425).

Results of the analysis for the 11th grade minutes of physical education revealed a significant partial correlation of .363($p=.041$) between the 11th grade minutes of physical education and the number of outdoor concrete spaces available for physical education controlling for school size, however, no other significant relationships were found.

Non-significant partial correlations were found between the minutes physical education is offered to 11th grade and the total number of facilities (.181, $p=.322$), the number of indoor spaces (-0.039, $p=.831$), and the number of outdoor grassy spaces (.104, $p=.571$). Non-significant partial correlations were also found between the minutes physical education is offered to 11th grade and the availability of a swimming pool (.145, $p=.429$), a track (.002, $p=.991$), a climbing wall (.163, $p=.374$), or a fitness center (.083, $p=.651$).

Results of the analysis showed a non-significant partial correlation between the minutes physical education is offered to 12th grade and the total number of facilities (.044, $p=.810$), the number of indoor spaces (-0.074, $p=.686$), the number of outdoor grassy spaces (-.031, $p=.865$), and the number of outdoor concrete spaces (.283, $p=.117$). Non-significant partial correlations were also found between the minutes physical education is offered to 12th grade and the availability of a swimming pool (.128, $p=.487$), a track (.074, $p=.686$), a climbing wall (.022, $p=.906$), or a fitness center (-.072, $p=.695$). These results suggest that school size does not influence the relationship between the facilities available to support physical education and the minutes physical education is offered to students in grades 10-12 in the schools participating in this study.

4.9.2 Analysis of Data to Test Hypothesis 6b: It is hypothesized that high schools with a locale of “urban fringe of a large city” will have more facilities available to support physical education and this will result in more minutes of physical education minutes being

offered to students in these high schools compared to high schools in other locale classifications.

As presented in section 4.6.2, a two-factor (Grade X School Size) repeated measures ANOVA was performed and revealed a non-significant Grade Effect, School Locale Effect, and Grade X School Locale Interaction Effect for minutes of physical education offered. These data are shown in Table 20. In addition to the parametric test, the nonparametric Kruskal-Wallis H Test was used and revealed a non-significant difference between physical education instruction time and school locale.

A one-way ANOVA was computed to compare the number of facilities including the total number of facilities, number of indoor spaces, number of outdoor grass spaces and the number of outdoor concrete spaces available within each school to support physical education and school locale. As shown in Table 29, no significant differences were found between school locale and the total number of facilities available within each school to support physical education ($F(3, 31) = 1.146, p=.346$), the number of indoor spaces available ($F(3, 31) = 1.199, p=.326$), the number of outdoor grass spaces available ($F(3, 31) = 1.361, p=.273$), or the number of outdoor concrete spaces available ($F(3, 31) = .459, p=.731$).

The chi-square test of independence was used to compare the availability of facilities including a swimming pool, track, rock climbing wall and a fitness center within each school and school locale. Data is presented in table 30. A significant relationship was found between school size and the availability of a climbing wall ($\chi^2(3) = 8.827, p=.032$). No significant relationship was found between school size and the availability of a swimming pool ($\chi^2(3) =$

1.294, $p=.731$), the availability of a track ($\chi^2(3) = 1.160$, $p=.763$), or the availability of a fitness center ($\chi^2(3) = 1.099$, $p=.777$).

Table 29. One-Way Analysis of Variance (ANOVA) to Compare the Facilities Available to Support Physical Education between School Locales.

Facilities	School Locale Categories				F Value	p-value
	Large City	Urban Fringe of a Large City	Rural Outside CBSA	Rural Inside CBSA		
Total Facilities	7.0±4.2	10.0±3.6	7.2±1.5	10.2±5.0	1.146	0.346
Indoor Spaces	3.0±1.4	3.5±1.7	2.0±1.0	3.0±2.1	1.199	0.326
Outdoor Grass Spaces	1.0±1.4	3.2±1.9	2.4±1.1	3.7±2.1	1.361	0.273
Outdoor Concrete Spaces	0.5±0.7	1.1±1.0	0.8±0.8	0.8±0.8	0.459	0.713

Note: Values with the same superscript within each grade level are significantly different at $p<0.05$.

Table 30. Chi-Square Analysis for the Facilities Available Within Each School to Support Physical Education and School Locale.

Facilities		School Locale Categories				χ^2 (p-value)
		Large City (N=2)	Urban Fringe of a Large City (N=22)	Rural Outside CBSA (N=5)	Rural Inside CBSA (N=6)	
Swimming Pool	N*	1	10	1	3	1.294
	%*	50.0	45.5	20.0	50.0	0.731
Track and Field	N*	2	15	4	4	1.160
	%*	100.0	68.1	80.0	66.7	0.763
Rock Climbing Wall	N*	0	5	2	5	8.827
	%*	0.0	22.7	40.0	83.3	0.032
Fitness Center	N*	2	15	3	4	1.099
	%*	100.0	68.1	60.0	66.7	0.777

*Reflect schools that have these facilities available.

Linear regression analysis was performed to examine the relationship between minutes of physical education offered for 10th, 11th and 12th grades and the facilities available to support physical education controlling for school locale. Dummy variables were entered into the model to control for school locale. Results of this analysis showed a non-significant partial correlation between the minutes physical education is offered to 10th grade and the total number of facilities (.033, p=.858), the number of indoor spaces (-0.178, p=.331), the number of outdoor grassy spaces (.121, p=.551), and the number of outdoor concrete spaces (.108, p=.556). Non-significant partial correlations were also found between the minutes physical education is offered to 10th grade and the availability of a swimming pool (-.017, p=.926), a track (.027, p=.884), a climbing wall (.108, p=.556), or a fitness center (.091, p=.620).

Results of the analysis for 11th grade showed a non-significant partial correlation between minutes physical education is offered to 11th grade and the total number of facilities (.142, $p=.438$), the number of indoor spaces (-0.099, $p=.588$), the number of outdoor grassy spaces (.143, $p=.436$), and the number of outdoor concrete spaces (.344, $p=.054$). Non-significant partial correlations were also found between the minutes physical education is offered to 11th grade and the availability of a swimming pool (0.003, $p=.986$), a track (.002, $p=.992$), a climbing wall (.173, $p=.344$), or a fitness center (.037, $p=.842$).

Non-significant partial correlations were found between minutes physical education is offered to 12th grade and the total number of facilities (.132, $p=.470$), the number of indoor spaces (-.007, $p=.971$), the number of outdoor grass spaces (.113, $p=.538$), and the number of outdoor concrete spaces (.241, $p=.184$). Non-significant partial correlations were also found between the minutes physical education is offered to 12th grade and the availability of a swimming pool (0.000, $p=.998$), a track (.077, $p=.677$), a climbing wall (.099, $p=.591$), or a fitness center (-.089, $p=.627$). These results suggest that school locale does not influence the relationship between the facilities available to support physical education and the minutes physical education is offered to grades 10, 11 and 12 in the schools participating in this study.

4.9.3 Analysis of Data to Test Hypothesis 6c: It is hypothesized that high schools with a lower percentage of students receiving free or reduced lunch will have more facilities available to support physical education and this will result in more minutes of physical education minutes being offered to students in these high schools compared to high schools with a higher percentage of students receiving free or reduced lunch.

As presented in section 4.6.3, a two-factor (Grade X School SES Status) repeated measures ANOVA was performed and revealed a non-significant Grade Effect, School SES Status Effect, and Grade X School SES Status Interaction Effect for minutes of physical education offered. These data are shown in Table 22. In addition to the parametric test, the nonparametric Kruskal-Wallis H Test was used and revealed a non-significant difference between physical education instruction time and school SES status.

A one-way ANOVA was computed to compare the number of facilities including the total number of facilities, number of indoor spaces, number of outdoor grass spaces and the number of outdoor concrete spaces available within each school to support physical education and school SES status. As shown in Table 31, no significant differences were found between school SES status and the total number of facilities available within each school to support physical education ($F(2, 32) = .303, p=.741$), the number of indoor spaces available ($F(2, 32) = 2.248, p=.122$), the number of outdoor grass spaces available ($F(2, 32) = .251, p=.780$), or the number of outdoor concrete spaces available ($F(2, 32) = 1.161, p=.326$).

The chi-square test of independence was used to compare the availability of facilities including a swimming pool, track, rock climbing wall and a fitness center within each school and school locale. Data is presented in table 32. No significant relationship was found between school SES status and the availability of a swimming pool ($\chi^2(2) = .725, p=.696$), the availability of a track ($\chi^2(2) = .217, p=.897$), the availability of a climbing wall ($\chi^2(2) = 2.553, p=.279$), or the availability of a fitness center ($\chi^2(2) = .375, p=.829$).

Table 31. One-Way Analysis of Variance (ANOVA) to Compare the Facilities Available to Support Physical Education between School SES Status.

Facilities	School SES Status (tertiles of percent of students receiving free and reduced price lunch)			F value	p-value
	Lowest Tertile	Middle Tertile	Highest Tertile		
	(1% to <14.8%) (N=13)	(14.8% to <32.3%) (N=11)	(32.3% to 100%) (N=13)		
Total Facilities	10.1±3.2	9.3±4.0	8.9±4.0	0.303	0.741
Indoor Spaces	4.0±1.5	2.9±1.9	2.7±1.5	2.248	0.122
Outdoor Grass Spaces	3.2±1.9	3.3±1.7	2.8±2.1	0.251	0.780
Outdoor Concrete Spaces	0.8±1.1	0.8±0.8	1.3±0.9	1.161	0.326

Note: Values with the same superscript within each grade level are significantly different at $p < 0.05$.

Table 32. Chi-Square Analysis for the Facilities Available Within Each School to Support Physical Education and School SES Status.

Facilities		School SES Status (tertiles of percent of students receiving free and reduced price lunch)			χ^2 (p-value)
		Lowest Tertile (1% to <14.8%) (N=12)	Middle Tertile (14.8% to <32.3%) (N=11)	Highest Tertile (32.3% to 100%) (N=12)	
Swimming Pool	N*	6	5	4	0.725
	%*	50.0	45.5	33.3	0.696
Track and Field	N*	9	8	8	0.217
	%*	75.0	72.7	66.7	0.897
Rock Climbing Wall	N*	2	5	5	2.553
	%*	16.7	45.5	41.7	0.279
Fitness Center	N*	8	7	9	0.375
	%*	66.7	63.6	75.0	0.829

*Reflect schools that have these facilities available.

Linear regression analysis was performed to examine the relationship between minutes of physical education offered and the facilities available to support physical education controlling for school SES status based on the percentage of students receiving a free and reduced price lunch. Percent of students receiving a free and reduced lunch was controlled in the analysis as a continuous variable. Results of this analysis showed a non-significant partial correlation between the minutes physical education is offered to 10th grade and the total number of facilities (.129, p=.466), the number of indoor spaces (-0.001, p=.994), the number of outdoor grassy spaces (.184, p=.298), and the number of outdoor concrete spaces (.026, p=.885). Non-significant partial correlations were also found between the minutes physical education is offered

to 10th grade and the availability of a swimming pool (.066, $p=.709$), a track (.056, $p=.751$), a climbing wall (.024, $p=.894$), or a fitness center (.093, $p=.601$).

Results of the analysis for 11th grade showed a non-significant partial correlation between minutes physical education is offered to 11th grade and the total number of facilities (.273, $p=.119$), the number of indoor spaces (-0.131, $p=.461$), the number of outdoor grassy spaces (.222, $p=.207$), and the number of outdoor concrete spaces (.271, $p=.122$). Non-significant partial correlations were also found between the minutes physical education is offered to 11th grade and the availability of a swimming pool (0.116, $p=.512$), a track (.016, $p=.930$), a climbing wall (.068, $p=.704$), or a fitness center (.048, $p=.788$).

Non-significant partial correlations were found between minutes physical education is offered to 12th grade and the total number of facilities (.207, $p=.240$), the number of indoor spaces (-.238, $p=.176$), the number of outdoor grass spaces (.114, $p=.519$), and the number of outdoor concrete spaces (.193, $p=.274$). Non-significant partial correlations were also found between the minutes physical education is offered to 12th grade and the availability of a swimming pool (0.081, $p=.650$), a track (.105, $p=.554$), a climbing wall (-.179, $p=.312$), or a fitness center (-.060, $p=.738$). These results suggest that SES status does not influence the relationship between the facilities available to support physical education and the minutes physical education is offered to grades 10, 11, and 12 in the study schools.

4.10 SUMMARY

A summary of the results for specific aims 1-6 is shown in Appendix E.

5. DISCUSSION

5.1 INTRODUCTION

Improving the quality of physical education is necessary to achieve potential health-benefits in children and adolescents (5, 63, 69, 83). To help guide the development of quality physical education programs, the National Association for Sport and Physical Education (NASPE) has proposed guidelines for physical education instruction time, physical education teacher qualifications, and availability of physical education facilities. This study focused on describing these components in high schools (10th, 11th, 12th grades) located in southwestern Pennsylvania, and examined whether there are demographic characteristics of the school (locale, size, SES status) that affect these factors. This information may be valuable in understanding how to improve the quality of physical education across schools with diverse characteristics, and may lead to the development of interventions and policies to improve the quality of physical education in high schools.

The quality of physical education is critical to improving the health status of children and adolescents (20, 39). A study conducted by Carrel et al (83) reported that participation in a quality fitness based physical education program resulted in a significantly greater loss of body fat, a greater increase in cardiovascular fitness and greater improvements in fasting insulin levels. Singh et al (84) reported that an improved physical education program resulted in significant differences in hip circumference, sum of skin folds and waist circumference. The

results from Sallis et al (69) also suggest that schools that offer quality physical education programs may be able to improve health outcomes in children. The results of these studies demonstrate that a quality physical education program may be important for improving health-related outcomes in children and adolescents.

5.2 PHYSICAL EDUCATION INSTRUCTION TIME

The NASPE guidelines recommend 225 minutes of physical education instruction time be allocated in high schools (51). The survey instrument used for this study only permitted the identification of schools achieving ≥ 180 minutes per week of physical education instruction time. Results showed that the percentage of schools providing ≥ 180 minutes per week of physical education instruction time was 21.1% in 10th grade, 18.9% in 11th grade, and 13.5% in 12th grade (see Table 10). As shown in Table 11, the mean instruction time across all grade levels survey was less than 50% of the NASPE recommended 225 minutes per week. Moreover, this study revealed that the majority of high schools in Southwestern Pennsylvania offer physical education two days per week or less, as shown in Table 8. This is consistent with information published in the 2006 *Shape of the Nation Report* (42), which reported that only 2.1% of high schools provide daily physical education or its equivalent (150 minutes per week in elementary school and 225 minutes per week in middle or high school) for the entire school year and only 3.0% of high schools provided physical education at least 3 days per week for the entire school year. Thus, despite recommendations for daily physical education that meets a minimum duration of instruction time, it appears that few high schools in Southwestern Pennsylvania meet this standard of instruction.

In addition to schools not meeting NASPE's recommendation of 225 minutes per week of physical education instruction time, Fairclough and Stratton (91) reported that students are engaged in moderate-and-vigorous physical activity for only 34.3% of the allocated instruction time in a typical physical education. When applied to the data from this study, 10th, 11th, and 12th grade students would be active in physical education for only 35.9, 34.3, and 31.7 minutes per week, respectively. Moreover, this would suggest that high school physical education is providing only 7.5-8.4% of the recommended 60 minutes per day of moderate-to-vigorous physical activity. This is particularly alarming considering the well-documented inverse relationship between physical activity and health risk. Further research is needed to determine how to increase activity time within physical education class. However, it should be noted that it is unlikely that physical education alone can provide all of the required daily physical activity, and therefore research should also focus strategies for improving physical activity of high schools students outside of the school environment.

5.3 EFFECT OF STUDENT-TO-TEACHER RATIO ON PHYSICAL EDUCATION INSTRUCTION TIME

The results of this study showed that the reported student-to-teacher ratio in physical education class ranged from approximately 66 to 77 students per teacher between grades 10 and 12 (see Table 7), which is higher than the state average student-to-teacher ratio of 15 students per teacher as reported by the National Center for Education Statistics (NCES). The results of the *Tennessee Class Size Project* (85) support smaller class size to improve academic performance, with results showing that students in smaller classes (13-17 students) score significantly higher on

standardized tests than students in larger classes (22-25 students). However, within the state of Pennsylvania a mandate does not exist to direct the student-to-teacher ratio for physical education classes (58).

This study also showed that student-to-teacher ratio was not significantly correlated with physical education instruction time (see Table 15). However, results from this study must be interpreted with caution as they only reflect instruction time for physical education that is offered, which is not necessarily reflecting time that students are active within physical education class. It is possible that a smaller student-to-teacher ratio would result in improved physical activity time within physical education. Although very little research exists to determine if the benefits of smaller class sizes translate into participation in physical activity during physical education, the Centers for Disease Control (CDC) that schools adopt policies to ensure that student-to-teacher ratios in physical education are comparable to those in other subjects (20). Thus, future research is needed to determine if reducing physical education class size would result in an increase in physical activity during physical education classes and whether this would translate into improve health-related outcomes of high school students.

5.4 EFFECT OF TEACHER QUALIFICATIONS ON PHYSICAL EDUCATION INSTRUCTION TIME

Results from this study indicated that 96.9% of physical education teachers had at least an undergraduate degree in physical education with 65.0% having a graduate degree in physical education. This appears to suggest that most schools meet the NASPE recommendation for physical education to be taught by qualified teachers, which in this case is assessed by academic

degree achieved in physical education. This is also consistent with the data published in the 2006 *Shape of the Nation Report* (42), which reported that the majority of schools require newly hired physical education teachers to have an undergraduate or graduate training in physical education or a related field.

Despite these findings it does not appear from the results of this study that academic training of physical education teachers significantly influenced the amount of physical education instruction time. As shown in Table 16, there were non-significant associations found between number and percent of teachers with an undergraduate or graduate degree and physical education instruction time. However, these findings cannot address whether teacher qualifications affect the quality of physical education. For example, McKenzie et al (70) reported that the implementation of an enhanced physical education curriculum focusing on health-related activities and teacher training significantly ($p=0.02$) improved moderate-to-vigorous physical activity in physical education by approximately 3 minutes per lesson. Moreover, McKenzie et al (75) investigated the effect of a modified physical education curriculum delivered by physical education teachers who received additional training on the level (low, moderate, or vigorous) of physical activity among elementary school students. Results of the study revealed that students receiving a modified physical education curriculum led by teachers who received additional training engaged in more moderate-to-vigorous physical activity than students in the control schools ($p=0.02$). The results of these studies suggest that teacher qualifications and training may be important for increasing physical activity in children in schools. However, there is no empirical evidence that teachers with a graduate degree provide a higher quality of physical education than teachers with an undergraduate degree, and this may be an area of study for future research. Moreover, considering that most teachers are required to have at least an

undergraduate teaching degree in physical education, research may need to focus on other factors such as experience, classroom preparation time, etc. to differentiate the quality of instruction between physical education teachers.

5.5 EFFECT OF PHYSICAL EDUCATION FACILITIES ON PHYSICAL EDUCATION INSTRUCTION TIME

The descriptive results from the facilities data revealed that 100% of respondent schools have access to indoor spaces, 94.3% of schools have outdoor grass spaces, 71.4% of schools have a track, 68.6% have access to a fitness center and 62.9% have outdoor concrete spaces. This is consistent with the statistics from the 2006 School Health and Policies and Programs Study (58). This study reported that nationwide more than 75% of high schools had access to a gymnasium, weight room, baseball or softball field, general use field, and soccer or football field for physical education (58).

However, results of this study showed non-significant correlations between the number of facilities, both total and by specific type of facility, and physical education instruction time available within the school at either the 10th, 11th, or 12th grade (see Table 17). Thus, the hypothesis that there would be a significant correlation between physical education facilities and physical education instruction time was rejected based on these data. These findings may not be consistent with other studies available in the literature. For example, Haug et al (76) investigated the relationship of facilities and physical activity in adolescents and found that that students who attended high schools with many facilities had 4.49 times (95%CI=1.93-10.44) higher odds of being physically active compared to students in high schools with fewer facilities. Moreover,

Sallis et al (78) conducted a study to assess the association of school environmental characteristics with student physical activity and found that students in schools with a high number of facilities were more active than students in schools with a low number of facilities. These studies suggest that the availability of facilities may be important for increasing physical activity among children, and the lack of an association in the current study may reflect that instruction time rather than specific activity time was measured on the survey. Thus, future research may be needed to further determine the influence of physical education facilities on quality of physical education instruction in high schools.

5.6 EFFECT OF SCHOOL SIZE, SCHOOL LOCALE, AND SCHOOL SES STATUS ON STUDY RESULTS

Results of this study indicate that school size may have an effect on student-to-teacher ratio with larger schools having a high student-to-teacher ratio compared to smaller schools, as shown in Table 18. However, there was no significant relationship between schools size and teacher qualifications or facilities. Additionally, the results of the study suggest that schools size does not influence the relationship between instruction time and factors such as student-to-teacher ratio, teacher qualification, and facilities available to support physical education. These results are in contrast to the current literature, as reported by Jones et al (82), which suggests that larger schools may have more health promoting policies and facilities than smaller schools thus offering students increased opportunities physical activity. Although this research suggests that school size may affect opportunities for physical activity, the current study measured instruction time which may account for the lack of association.

The results of this study suggest that the locale of the school has limited impact on the physical education variables examined. For example, while this study showed a significant difference in the number of physical education teachers with an undergraduate degree based on school locale, this finding may simply reflect differences in school size, because there was no significant difference for the percent of physical education teachers with an undergraduate or graduate degree when compared school locale categories (see Table 25). There was no difference in the student-to-teacher ratio between school locale categories (see Table 21). Moreover, aside from access to a rock climbing wall (see Table 30), access to facilities to support physical education instruction appears to be unaffected by the locale of the school. However, these findings that suggest no effect of school locale of physical education instruction variables may be inconsistent with the current literature. Springer et al (81) conducted a study to examine physical activity levels of students in 4th, 8th, and 11th grades by urban, suburban and rural locations, and found that urban students reported lower levels of physical activity compared to students in suburban and rural locations. These results suggests that locale may affect participation in physical activity in children and adolescents; however, the current study assessed instruction time rather than time spent engaged in physical activity which may account for the differences in findings between these studies. Thus, it may be necessary to further examine the effect of school locale on components of physical education instruction, which may provide insight into how these potential differences affect the quality of physical education programs in these geographical areas.

The results of this study revealed a significant effect of school SES status on the student-to-teacher ratio with those with higher percentages of students receiving free and reduced lunch having a higher student-to-teacher ratio (Table 23). However, there was no significant

relationship between school SES status and teacher qualifications or facilities. Additionally, the results of the study suggest that schools SES status does not influence the relationship between instruction time and factors such as student-to-teacher ratio, teacher qualification, and facilities available to support physical education. These results are in contrast with the current literature. Butcher et al (79) examined if demographic factors such as race/ethnicity, education level, and SES status affected physical activity participation in adolescents and found that adolescents living a household of higher SES status participated in higher levels of physical activity when compared to middle and low SES households. Although this research suggests that SES status may affect physical activity participation, the current study measured instruction time in physical education, which may account for the lack of association in the results.

5.7 LIMITATIONS AND FUTURE RESEARCH

This study is not without limitations which could impact the application of the observed results.

The following limitations and recommendations should be considered for future research:

1. **Instruction Time versus Physical Activity.** The survey used in this study assessed the number of minutes that physical education is offered to high school students in Southwestern Pennsylvania. However, this may not reflect the time that students are actually engaged in physical activity during physical education class. Thus, the lack of an association between the factors examined in this study and physical education instruction time may be misleading when determining their effect on quality physical education programs. Thus, future studies should examine the amount of time students

are engaged in physical activity within a physical education class period to determine factors that influence this parameter of quality physical education.

2. **Small Sample Size.** There are 91 public high schools in Allegheny, Beaver, Indiana, and Westmoreland counties, which are the counties examined in this study. Despite an invitation for all of these schools to participate in the study, only 39 schools chose to respond to the electronic survey. Thus, it is unable to be determined if the results of this study only represent the findings for the respondent schools or if they are generalizable to all schools within the survey region. Additionally, during analysis of the results trends towards significance were found between the minutes physical education is offered to students in 11th grade and the number and percent of teachers with an undergraduate degree ($p=.076$) and the number of outdoor concrete spaces available to support physical education ($p=.056$). Trends towards significance were also found between school locale and the student-to-teacher ratio ($p=.071$) and between school SES status and minutes physical education is offered by grade level ($p=.089$). Future research may need to focus on alternative recruitment strategies to increase the representative pool of schools that provide information with regard to physical education instruction and to determine the significance of these trends.
3. **Geographical Region.** The study population was limited to the geographic area of Southwestern Pennsylvania which surrounds the research team. It is unable to be determined if the results of this study only represent the findings from this geographical region or if they are generalizable beyond this geographical region. Future studies need to be conducted to determine if findings from this study are consistent with other geographical areas in Pennsylvania and nationwide, and this

may inform policies and procedures to improve the quality of physical education regionally and nationally.

4. **Limited Grade Levels.** This study focused specifically on examining factors that may contribute to physical education in high school students. However, the current literature suggests that participation in physical education decreases as students progress from elementary school to middle school to high school (20, 26, 52). It is unable to be determined if the results of this study only represent what would be observed within high schools, or if these findings can be generalized to other grade levels. It is recommended that future studies be conducted to examine these factors in elementary and middle schools.
5. **Instrument Distribution.** The survey was distributed electronically and was completed online. The advantages of this method include being able to cover a large geographic area, the survey can be completed at the convenience of the respondent, and the survey can be distributed and completed quickly. However, the potential disadvantages of a self administered online survey are that the respondent must have internet/email access and the respondent is competent in the use of a computer to respond to the survey. While unable to be determined, providing only an online version of the survey in this study may have limited participation by some schools. Therefore, future studies should considered using a mixed-mode survey approach that allows the respondent to complete an online, paper, or interviewer-based survey.
6. **Accuracy of the Respondent.** The survey was distributed to the physical education department chairperson or physical education teacher designated by the school. This individual was targeted based on their knowledge of the school demographic

information and physical education curriculum. Respondents were asked to report specific information on instruction time, education level of their colleagues and facilities available to support physical education. Thus, the subjective nature of these data as reported by the respondent may have resulted in inaccurate or biased information, which may have affected the interpretation of the results of this study. Therefore, future studies should implement assessment objective assessment techniques to improve the accuracy of the data collection, and this may involve direct observation by investigators to assess variables of interest related to the quality of physical education programs and instruction. .

7. **Survey Factors.** A survey instrument was developed specifically for the use in this study, and was based on NASPE's recommendations for a quality physical education program. Thus, despite finding that this survey had acceptable reliability, additional research may be needed to improve the validity and reliability of the survey instrument to improve the quality of the data collected. This may include conducting onsite direct observation of physical education or structured interviews to objectively assess factors that may influence the quality of physical education programming and instruction.

5.8 CONCLUSION

Improving the quality of physical education is necessary to achieve potential health-benefits in the child and adolescent populations (5, 63). To help define and guide the development of quality physical education programs, NASPE has developed specific criteria and

recommendations for components of physical education including instruction time, teacher qualifications and adequate facilities. Evidence exists which supports that each of these components can affect the quality of physical education delivered in school settings; however, what is unclear is the ability of schools to achieve these components and whether there are demographic characteristics of the school that may affect the ability of the school to implement these guidelines as recommended. This primary focus of this study was to describe components such as instruction time, teacher qualifications and facilities available to support physical education in high schools (10th, 11th, 12th grades) located in southwestern Pennsylvania, and to determine whether there are demographic characteristics of the school (locale, size, SES status) that affect these components. The results of this study suggest that allocated physical education instruction time does not appear to be influenced by physical education teacher qualifications or facilities available to support physical education instruction. Moreover, the pattern of results does not appear to be affected by school size, school locale, or SES status of the school. The original conceptual model proposed has been revised based on the results of this study and is shown below in Figure 3.

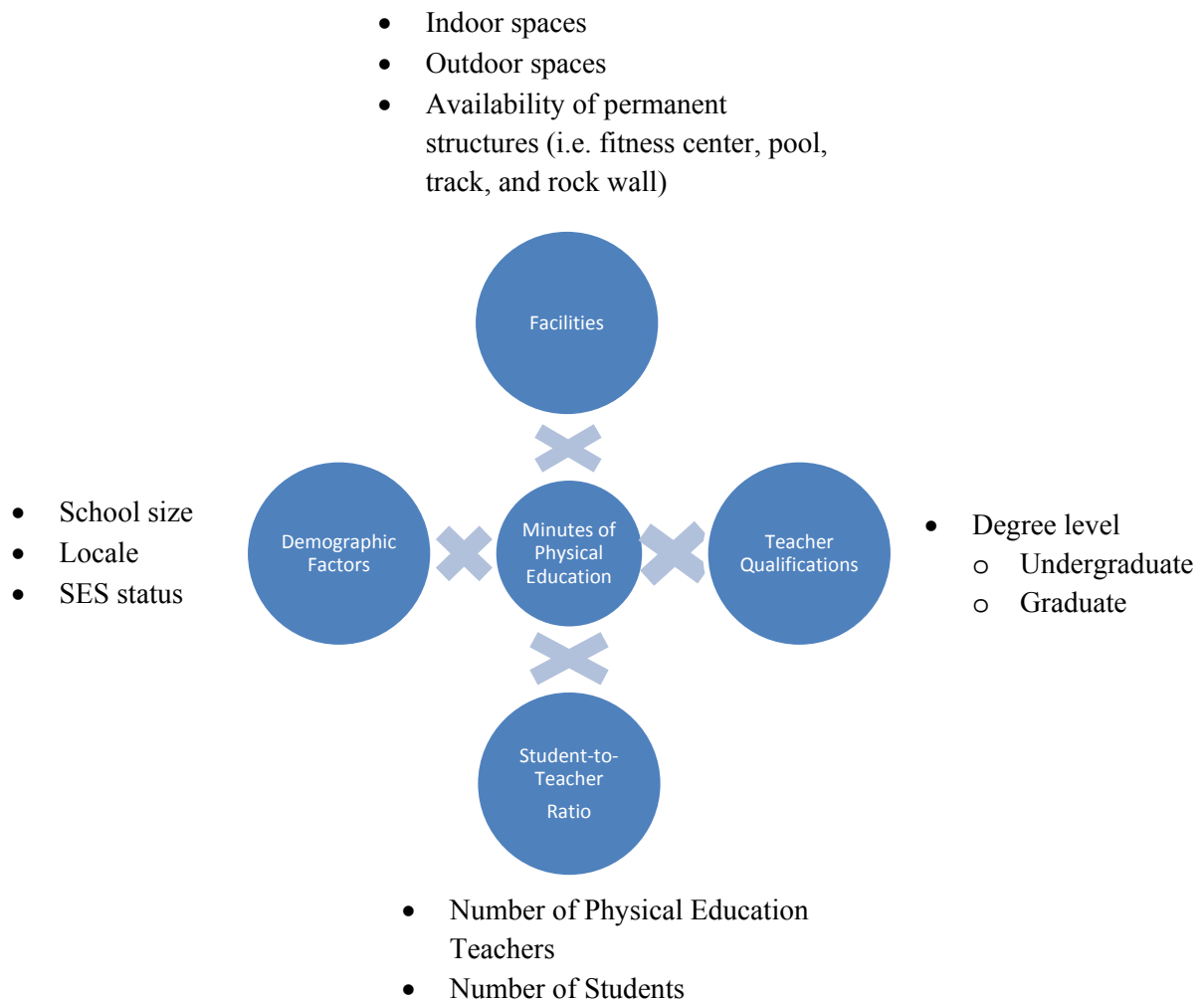


Figure 3: Revised Conceptual Model

The results of the current study suggest that teacher qualifications, facilities and demographic factors such as school size, locale and SES status do not influence physical education instruction time and consequently, do not impact the quality of physical education. Quality physical education, however, may be necessary for improving health outcomes in children. Thus, it becomes important to identify other factors or barriers to implementing quality

physical education. Results of a study conducted by Barroso et al (80) revealed that physical education teachers identified factors such as large class sizes, low priority compared to other academic subjects and inadequate financial resources as the top three barriers to implementing quality physical education programs. Future research is needed to identify strategies for improving the quality of physical education despite these barriers.

Although the present study was not without limitations, it is the first study to investigate the ability of schools in Southwestern Pennsylvania to achieve NASPE's components for quality physical education and to determine whether there are demographic factors that affect the ability of the schools to implement these guidelines. While this study examined the effect of these factors on physical education instruction time, it is important to differentiate instruction time from measured physical activity within the period of physical education instruction. In fact, the current literature investigating the influence of demographic factors on physical education has focused on physical activity rather than instruction time (75-76, 79, 81-82, 85). However, the NASPE guidelines for quality physical education focus on instruction time. Therefore, it may be necessary to revise the guidelines for a quality physical education to include participation in physical activity rather than duration of instruction time.

APPENDIX A: PHYSICAL EDUCATION TEACHER INVITATION LETTER

Dear Fellow Educator:

You are invited to participate in an exciting research study because of your role in the physical education department either as the department chairperson or as an experienced physical education teacher within your school district. I am currently a doctoral student in the Department of Health and Physical Activity at the University of Pittsburgh and a faculty member at Indiana University of Pennsylvania. The purpose of this research study is to examine the prevalence of school districts to achieve the physical education guidelines developed by the National Association for Sport and Physical Education (NASPE). For that reason, we will be surveying physical education teachers from high schools in Pennsylvania and asking them to complete a brief (approximately 10 minutes) online survey.

If you are willing to participate, our online survey will ask about background (e.g., your role in the school district, number of years you have taught, and how long you have been employed with your current district), as well as about your school's physical education curriculum including time requirements for physical education, facilities, professional development opportunities and curriculum design. There are no foreseeable risks associated with this project, nor are there any direct benefits to you. As an advantage to you and your school district, you will have the opportunity to request a copy of the findings of this study. This is an entirely anonymous survey, and so your responses will not be identifiable in any way. All responses are confidential, and results will be kept under lock and key.

If you would like to participate in this study, click on the link listed below to access the online survey. Your participation is voluntary, and you may withdraw from this project at any time. This study is being conducted by Keri S. Kulik, who can be reached at 412.736.6696, if you have any questions.

If your school policy requires that approval for your participation in this study be obtained from the Principal, Superintendent, or other school entity prior to conducting the study please let me know so that appropriate steps can be taken to obtain this approval

I thank you in advance for your time and cooperation.

Survey Link

<http://www.XXXXXXXXXX.com>

Sincerely,
Keri S. Kulik, MS, CSCS

Department of Health and Physical Education
Zink Hall, Room 232
1190 Maple Street
Indiana, Pennsylvania 15705

This project has been approved by the University of Pittsburgh Institutional Review Board and the Indiana University of Pennsylvania Institutional Review Board.

APPENDIX B: PHYSICAL EDUCATION TEACHER REMINDER LETTER

Dear Fellow Educator:

The purpose of this email is to remind you that you have been invited to participate in a research study. The purpose of this research study is to examine the prevalence of school districts to achieve the physical education guidelines developed by the National Association for Sport and Physical Education (NASPE). If you have already completed the online survey, I thank you for your time.

If you are willing to participate, our online survey will ask about background (e.g., your role in the school district, number of years you have taught, and how long you have been employed with your current district), as well as about your school's physical education curriculum including time requirements for physical education, facilities, professional development opportunities and curriculum design. There are no foreseeable risks associated with this project, nor are there any direct benefits to you. As an advantage to you and your school district, you will have the opportunity to request a copy of the findings of this study. This is an entirely anonymous survey, and so your responses will not be identifiable in any way. All responses are confidential, and results will be kept under lock and key.

If you would like to participate in this study, click on the link listed below to access the online survey. Your participation is voluntary, and you may withdraw from this project at any time. This study is being conducted by Keri S. Kulik, who can be reached at 412.736.6696, if you have any questions.

If your school policy requires that approval for your participation in this study be obtained from the Principal, Superintendent, or other school entity prior to conducting the study please let me know so that appropriate steps can be taken to obtain this approval

I thank you in advance for your time and cooperation.

Survey Link

<http://www.XXXXXXXXXX.com>

I thank you in advance for your time and cooperation.

Sincerely,
Keri S. Kulik, MS, CSCS
Department of Health and Physical Education

Zink Hall, Room 232
1190 Maple Street
Indiana, Pennsylvania 15705

This project has been approved by the University of Pittsburgh Institutional Review Board and the Indiana University of Pennsylvania Institutional Review Board.

APPENDIX C: PHONE SCRIPT FOR PHYSICAL EDUCATION TEACHER

Hello _____ (insert physical education teacher's name).

My name is _____ (insert researcher's name) and I am a fellow educator and doctoral student at the University Of Pittsburgh. I received permission from your principal to invite you participate in an exciting research study that is designed to examine the prevalence of school districts in our area achieving the physical education guidelines developed by the National Association for Sport and Physical Education (NASPE). The results of this study will provide us with information that may be used to enhance physical education programs by increasing physical activity to improve health-outcomes in children.

As part of our formal study, I am would like to ask you complete a phone survey. The survey is brief (approximately 10 minutes) and contains questions regarding your professional background (e.g., your role in the school district, number of years you have taught, and how long you have been employed with your current district), as well as questions about your school's physical education curriculum including time requirements for physical education, facilities, professional development opportunities and curriculum design.

Do you think that you would like to participation in this study?

{If No}: Thank you very much and have a great school year.

{If Yes}: Thank you. Before we start, I would like to let you know that your participation is voluntary and you may choose to stop the survey at any time. You also need to understand that all information that I receive from you by phone will be strictly confidential and will be kept under lock and key. Remember, the purpose of this study is to examine the prevalence of school districts in our area achieving the physical education guidelines developed by the National Association for Sport and Physical Education (NASPE).

Do I have your permission to ask you these questions?

{If No}: Thank you and have a great school year.

{If Yes}:

1. What is your current role in the school district?

Department Chairperson for the Physical Education Department

yes

no

Physical Education Teacher

yes

no

2. How many years have you served in this role?
3. How many total years have you been employed by this school district?
4. How is your school year divided? (i.e. 6 week periods, 9 week periods, semesters)
5. Are students in 10th grade offered different amounts of physical education per week during the school year? (For example, do students have physical education everyday for one semester and then not at all for the second semester?)
 - a. If yes, please explain.
6. On average, how many minutes per week do 10th grade students receive formal instruction in physical education for the entire school year?
7. On average, how many class periods per week do 10th grade students receive formal instruction in physical education for the entire school year?
8. Are students in 11th grade offered different amounts of physical education per week during the school year? (For example, do students have physical education everyday for one semester and then not at all for the second semester?)
 - a. If yes, please explain.
9. On average, how many minutes per week do 11th grade students receive physical education for the entire school year?
10. On average, how many class periods per week do 11th grade students receive formal instruction in physical education for the entire school year?
11. Are students in 12th grade offered different amounts of physical education per week during the school year? (For example, do students have physical education everyday for one semester and then not at all for the second semester?)
 - a. If yes, please explain.
12. On average, how many minutes per week do 12th grade students receive formal instruction in physical education for the entire school year?
13. On average, how many class periods per week do 12th grade students receive formal instruction in physical education for the entire school year?
14. How many credits of physical education are required for graduation?
15. How many total teachers in your school teach physical education?

16. How many teachers in your school teach 10th grade physical education?
17. How many teachers in your school teach 11^h grade physical education?
18. How many teachers in your school teach 12th grade physical education?
19. How many of the teachers who teach physical education have a current state license/certificate to teach physical education in the state of Pennsylvania?
20. How many of the teachers who teach physical education in your school have an undergraduate degree in physical education?
21. How many of the teachers who teach physical education in your school have a graduate degree in physical education?
22. How many of the physical education teachers have participated in at least one physical education-related professional development activity in the past 12 months?
23. How many of the physical education teachers have participated in at least two physical education-related professional development activities in the past 12 months?
24. Is there one assigned location for all physical education classes?
25. How many indoor spaces (i.e. gymnasiums or spaces of similar size) do you have for physical education classes?
26. How many outdoor grassy spaces (i.e. gymnasiums or spaces of similar size) do you have for physical education classes?
27. How many outdoor concrete/blacktopped spaces (i.e. gymnasiums or spaces of similar size) do you have for physical education classes?
28. Do you have a swimming pool available for physical education classes? If yes, how many?
29. Do you have a walking/running track available for physical education classes? If yes, how many?
30. Do you have a rock climbing wall available for physical education? If yes, how many?
31. Do you have a fitness center or weight room available for physical education? If yes, how many?
32. Are physical education classes ever cancelled or relocated to a space that is not appropriate for physical education and physical activity due to use of facilities by other programs?

APPENDIX D: SURVEY

Participant Information

1. What is your current role in the school district?

Department Chairperson for the Physical Education Department
Physical Education Teacher

yes no

yes no

2. How many years have you served in this role?

3. How many total years have you been employed by this school district?

Physical Education Curriculum

Instruction Time	
4.	How is your school year divided? (i.e. 6 week periods, 9 week periods, semesters)
5.	Are students in 10 th grade offered different amounts of physical education per week during the school year? (For example, do students have physical education everyday for one semester and then not at all for the second semester?)
a.	If yes, please explain.
6.	On average, how many minutes per week do 10 th grade students receive formal instruction in physical education for the entire school year?
7.	On average, how many class periods per week do 10 th grade students receive formal instruction in physical education for the entire school year?
8.	Are students in 11 th grade offered different amounts of physical education per week during the school year? (For example, do students have physical education everyday for one semester and then not at all for the second semester?)
a.	If yes, please explain.

9.	On average, how many minutes per week do 11 th grade students receive physical education for the entire school year?	
10.	On average, how many class periods per week do 11 th grade students receive formal instruction in physical education for the entire school year?	
11.	Are students in 12 th grade offered different amounts of physical education per week during the school year? (For example, do students have physical education everyday for one semester and then not at all for the second semester?)	
a.	If yes, please explain.	
12.	On average, how many minutes per week do 12 th grade students receive formal instruction in physical education for the entire school year?	
13.	On average, how many class periods per week do 12 th grade students receive formal instruction in physical education for the entire school year?	
14.	How many credits of physical education are required for graduation?	
Teacher Qualifications and Professional Development		
15.	How many total teachers in your school teach physical education?	
16.	How many teachers in your school teach 10 th grade physical education?	
17.	How many teachers in your school teach 11 th grade physical education?	
18.	How many teachers in your school teach 12 th grade physical education?	
19.	How many of the teachers who teach physical education have a current state license/certificate to teach physical education in the state of Pennsylvania?	
20.	How many of the teachers who teach physical education in your school have an undergraduate degree in physical education?	
21.	How many of the teachers who teach physical education in your school have a graduate degree in physical education?	
22.	How many of the physical education teachers have participated in at least <u>one</u> physical education-related professional development activity in the past 12 months?	
23.	How many of the physical education teachers have participated in at least <u>two</u> physical education-related professional development activities in the past 12 months?	
Facilities		
24.	Is there one assigned location for all physical education classes?	
25.	How many indoor spaces (i.e. gymnasiums or spaces of similar size) do you have for physical education classes?	
26.	How many outdoor grassy spaces (i.e. gymnasiums or spaces of similar size) do you have for physical education classes?	
27.	How many outdoor concrete/blacktopped spaces (i.e. gymnasiums or spaces of similar size) do you have for physical	

	education classes?	
28.	Do you have a swimming pool available for physical education classes? If yes, how many?	
29.	Do you have a walking/running track available for physical education classes? If yes, how many?	
30.	Do you have a rock climbing wall available for physical education? If yes, how many?	
31.	Do you have a fitness center or weight room available for physical education? If yes, how many?	
32.	Are physical education classes ever cancelled or relocated to a space that is not appropriate for physical education and physical activity due to use of facilities by other programs?	

APPENDIX E: RESULTS SUMMARY

Hypothesis	Conclusion
1. It was hypothesized that as the student-to-teacher ratio decreases, the number of minutes physical education is offered per year to students increases.	Reject Hypothesis
2. It was hypothesized that high schools with more teachers who have an undergraduate and graduate degree in Physical Education will offer more minutes of physical education to high school students.	Reject Hypothesis
3. It was hypothesized that high schools with more physical education facilities will offer more minutes of physical education to high school students.	Reject Hypothesis
4a. It was hypothesized that larger high schools, when compared to smaller high schools, will have a lower physical education student-to-teacher ratio and this will result in more minutes of physical education minutes being offered to students per year in these high schools.	Reject Hypothesis
4b. It was hypothesized that high schools with a locale of “urban fringe of a large city” will have a lower physical education student-to-teacher ratio and this will result in more minutes of physical education being offered to students per year in these high schools compared to high schools in other locale classifications.	Reject Hypothesis
4c. It was hypothesized that high schools with a lower percentage of students receiving free and reduced lunch will have a lower physical education student-to-teacher ratio and this will result in more minutes of physical education being offered to students per year in these high schools compared to high schools with a higher percentage of students receiving free or reduced lunch.	Reject Hypothesis
5a. It was hypothesized that larger high schools will have more teachers with an undergraduate or graduate degree to teach physical education and this will result in more minutes of physical education minutes being offered to students in these high schools compared to smaller high schools.	Reject Hypothesis
5b. It was hypothesized that high schools with a locale of “urban fringe of a large city” will have more teachers with an undergraduate or graduate degree to teach physical education and this will result in more minutes of physical education minutes being offered to students in these high schools compared to high schools in other locale classifications.	Reject Hypothesis
5c. It was hypothesized that high schools with a lower percentage of students receiving free and reduced lunch will have more teachers with an undergraduate or graduate degree to teach physical education and this will result in more minutes of physical education being offered to students in these high schools compared to high schools with a higher percent of students receiving free or reduced lunch.	Reject Hypothesis
6a. It was hypothesized that larger high schools will have more facilities available to support physical education and this will result in more minutes of physical education minutes being offered to students in these high schools compared to smaller high schools.	Reject Hypothesis

6b. It was hypothesized that high schools with a locale of “urban fringe of a large city” will have more facilities available to support physical education and this will result in more minutes of physical education minutes being offered to students in these high schools compared to high schools in other locale classifications.	Reject Hypothesis
6c. It was hypothesized that high schools with a lower percentage of students receiving free and reduced lunch will have more facilities available to support physical education and this will result in more minutes of physical education minutes being offered to students in these high schools compared to high schools with a higher percentage of students receiving free or reduced lunch.	Reject Hypothesis

APPENDIX F: INSTITUTIONAL REVIEW BOARD APPROVAL LETTER



University of Pittsburgh
Institutional Review Board

3500 Fifth Avenue
Pittsburgh, PA 15213
(412) 383-1480
(412) 383-1508 (fax)
<http://www.irb.pitt.edu/>

Memorandum

To: Keri Kulik, MS
From: Sue Beers, PhD, Vice Chair
Date: 3/24/2009
IRB#: [PRO09020309](#)
Subject: Implementation of a Quality Physical Education Program as Defined by the National Association for Sport and Physical Education of Public High Schools in Southwestern Pennsylvania

The above-referenced project has been reviewed by the Institutional Review Board. Based on the information provided, this project meets all the necessary criteria for an exemption, and is hereby designated as "exempt" under section 45 CFR 46.101(b)(2).

Please note the following information:

- If any modifications are made to this project, use the "**Send Comments to IRB Staff**" process from the project workspace to request a review to ensure it continues to meet the exempt category.
- Upon completion of your project, be sure to finalize the project by submitting a "**Study Completed**" report from the project workspace.

Please be advised that your research study may be audited periodically by the University of Pittsburgh Research Conduct and Compliance Office.

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